

OPERATION AND MAINTENANCE
MANUAL

UPPER BUTTE CREEK - PART NO. 2
FROM
LITTLE CHICO CREEK DIVERSION STRUCTURE
DOWN STREAM 9.3 MILES



U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

incl

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U. S. Army Engineer District, Sacramento
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April 1960

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LOCATION	ADDITION OR REVISION	DATE
1-03	Add subparagraph d	Dec 1970
1-05 c.	Add contract no. 71-C-0028	Dec 1970
2-04	Add to end of paragraph	Dec 1970
4-03 a.	Add subparagraph (3)	Dec 1970
Exhibit A-1	Delete old location map and add new location map	Dec 1970
Exhibit B	Add drawing no. 50-4-4534	Dec 1970
Exhibit F	Add copy of letter of acceptance dated 18 Feb 1971	Dec 1970
Exhibit F	Add copy of letter of acceptance dated 12 May 1953	28 Dec 2010
Exhibit F	Add copy of letter of transfer dated 15 Dec 1958	28 Dec 2010
Exhibit F	Add copy of letter of acceptance dated 26 Jan 1959	3 Feb 2011

TABLE OF CONTENTS

<u>Paragraph</u>	<u>Subject</u>	<u>Page</u>
<u>SECTION I - INTRODUCTION</u>		
1-01	Authorization	1
1-02	Location	1
1-03	Description of Project Works	1
1-04	Protection Provided	2
1-05	Construction Data and Contractor	2
1-06	Flood Flows	3
<u>SECTION II - LOCAL COOPERATION REQUIREMENTS</u>		
2-01	Applicable Portions of Flood Control Act	4
2-02	Project Document	4
2-03	Assurances Provided by Local Interests	4
2-04	Acceptance by and Transfer to the State Reclamation Board	4
<u>SECTION III - MAINTENANCE AND OPERATION - GENERAL PROCEDURE</u>		
3-01	Reference to Approved Regulations	5
3-02	Intent of Regulations	5
3-03	Purpose of this Manual	5
3-04	Definitions	6
3-05	General Provisions of Regulations	6
3-06	Assistance to be Furnished by the District Engineer	8
3-07	Responsibilities of the Superintendent	8
<u>SECTION IV - FEATURES OF THE PROJECT SUBJECT TO FLOOD CONTROL REGULATIONS</u>		
4-01	Project Works	13
4-02	Levees	13
4-03	Channels and Floodways	18
4-04	Drainage and Irrigation Structures	24
4-05	Little Chico Diversion Structure	27
4-06	Miscellaneous Facilities	28

TABLE OF CONTENTS (CONT'D)

<u>Paragraph</u>	<u>Subject</u>	<u>Page</u>
<u>SECTION V - SUGGESTED METHODS OF COMBATING FLOOD CONDITIONS</u>		
5-01	Methods Suggested	32
5-02	Earthen Levees	32
5-03	Premeditated Damage	32
5-04	Security	32
5-05	Inspection of Flood Control Works	33
5-06	Preliminary Repair Work	33
5-07	Disaster Relief	34
5-08	Flood Fight	34
5-09	Topping	36
5-10	Transportation	37
5-11	Use of Government Plant	37

EXHIBITS

A	Federal Flood Control Regulations	Sheets 1 and 2
A-1	Location Map	1 Sheet
B	"As Constructed" Drawings	Detached
C	Plates of Suggested Flood Fighting Methods	Plates 1 thru 10
D	Semi-Annual Report Form	Sheets 1 and 2
E	Check Lists - Levees, Channels and Structures	Sheets 1 thru 8
F	Letters of Acceptance and Transfer of Project	Sheets 1 thru 3
G	Sample Permit for Use of Right-of- Entry	Sheets 1 thru 4
H	Gaps in Levee that may Require Sandbagging	1 Sheet

OPERATION AND MAINTENANCE MANUAL
FOR
UPPER BUTTE CREEK - PART NO. 2
FROM
LITTLE CHICO CREEK DIVERSION STRUCTURE
DOWNSTREAM 9.3 MILES
BUTTE COUNTY, CALIFORNIA

SECTION I

INTRODUCTION

1-01. Authorization. The project work covered by this manual was authorized as a part of the Sacramento River and Major and Minor Tributaries Project, California by an Act of Congress (Public Law No. 534, Seventy-eighth Congress, Second Session, H.R. 4485), approved 22 December 1944. This act authorized diversion of a part of Little Chico Creek and construction of levees and channel enlargement of Upper Butte Creek near the town of Durham, California, in accordance with recommendations of the Chief of Engineers contained in a report entitled "Sacramento River and Tributaries, California, from Collinsville to Shasta Dam" (House Document No. 649, Seventy-eighth Congress, Second Session).

*Clearing &
digging on
Little Chico
done under
Sec 208 authority*

1-02. Location. The Butte Creek levee and channel improvement, as covered by this manual, (Part No. 2) extends from the Little Chico Creek Diversion structure downstream along the diversion channel and Butte Creek about 9.3 miles to old Highway No. 99E. This manual together with the manual for Upper Butte Creek - Part No. 1 dated April 1955 and entitled, "Upper Butte Creek - Part No. 1 from Highway No. 99E Downstream 8.7 Miles" constitutes the complete operation and maintenance manuals for the Upper Butte Creek portion of the Sacramento River and Major and Minor Tributaries Project. The project lies in the Sacramento Valley, California and easterly from the Cities of Chico, and Durham, in Butte County, California. Butte Creek rises on the west slope of the Sierra-Nevada Mountain Range and flows in a general southwesterly direction to its junction with the Sacramento River north of the town of Meridian, California. The connecting diversion channel between Little Chico Creek and Butte Creek is about 3 miles long and has intermittent levees along the right bank. From the junction of Butte Creek and the Little Chico Creek diversion channel, levees have been constructed along both banks of Butte Creek that extend downstream for a distance of about 7.3 miles to old Highway No. 99E. The project location is indicated on the location map of Exhibit A-1, inclosed herewith.

1-03. Description of the Project Works. The project works covered by this manual include the following:

- a. The Little Chico Creek Diversion Structure.

d. The cleared channel of Little Chico Creek that extends from the Diversion Structure downstream a distance of about 8.5 miles to Alberton Road (see EXHIBIT A-1).

1957 Hydrology - DM No. 1.

1. Little Chico Cr. $SPF = 6700 cfs = 175$

See 1970
Clearing &
Snagging

2. Div. channel design flow = 3000 cfs
with 3' Freeboard = 40 gr. but
will pass 4500 (SPF) with zero
freeboard.

3. See Page 18 (Paragraph 4-03 a. (3)) for
design flow of Little Chico Cr. which
is 3000 cfs.

b. The connecting diversion channel between Little Chico Creek and Butte Creek that is about 3 miles long. Also intermittent levees along this connecting diversion channel, all as shown on the drawings of Exhibit B.

c. The cleared and excavated channel of Butte Creek and levees along both banks from its junction with the diversion downstream about 7.3 miles.

1-04. Protection Provided. The project will afford flood protection to the city of Chico from flood flows in Little Chico Creek. It will also protect from flood flows in Butte Creek the town of Durham, 45,000 acres of adjacent agricultural lands, related buildings, and homes, U.S. Highway No. 99E, several county highways and three railroads. The project design flow for Little Chico Creek upstream from the diversion structure is estimated at 6,700 cubic feet per second and downstream from the diversion structure the flow in Little Chico Creek is limited to 2,200 cubic feet per second, which is the non-damaging capacity of the creek through the City of Chico. The remaining 4,500 cubic feet per second of flow is diverted over the concrete weir and through the diversion channel to Butte Creek. The project design flow for this diversion channel with a freeboard of 3 feet is 3,000 cubic feet per second, however, a flow of 4,500 cubic feet per second can pass down the channel with zero freeboard. The adopted freeboard for the levees on Butte Creek downstream from its junction with the diversion channel is such that it will contain the standard project flood of 40,000 cubic feet per second with no freeboard, or that it will contain the project design flow of 27,000 cubic feet per second with 3 feet of freeboard, whichever results in the higher levee. In the reach from old Highway No. 99E upstream to the Sacramento Northern Railway the former condition controls. From the Sacramento Northern Railway upstream to the end of the Butte Creek levees the latter condition controls. As shown on the drawings of Exhibit B, the grade of the adopted flood plane profile varies from elevation 233.6 on the right bank and 226.7 on the left bank at the upper end of the Butte Creek levees to elevation 137.4 at old Highway No. 99E. All elevations are referred to U.S. Corps of Engineers datum.

note
3000 CFS
dis over
Design Horse
slough

not true
See
50-4-4534
X-620

1116

1-05. Construction Data and Contractor. Construction required by the Corps of Engineers to bring levees of Butte Creek to project standards and to improve the channel was accomplished under the following contracts:

a. Levee construction and channel improvement along Butte Creek from old Highway No. 99E upstream to the Durham-Oroville Road was accomplished under Contract No. DA-04-167-CIVENG-58-5 by W. H. Darrough & Sons, contractor, during the period from 22 July 1957 to 3 January 1958.

b. Channel improvement and levee construction on the Little Chico Creek Diversion and on Butte Creek from the Durham-Oroville Road upstream 4.3 miles was accomplished under Contract No. DA404-167-CIVENG-58-65 by Upropina-Polich-Kral and W. H. Darrough & Sons, contractors, during the period from 26 May 1958 to 24 December 1958.

* c. Snagging and clearing on Little Chico Creek through city of Chico was accomplished under Contract No. DACW05-71-C-0028 by Frank J. Fuller during the period from 22 August 1970 to 30 October 1970. Drawing No. 50-4-4534.

1-06. Flood Flows. For purposes of this manual, the term "flood" or "high water period" shall refer to flows when the water surface in Butte Creek reaches or exceeds the reading of 10.0 on the State Department of Water Resources continuous water stage recorder and staff gage located on the right bank of Butte Creek 300 feet downstream from the Chico-Oroville bridge crossing.

* FULL SIZE DRAWINGS, INCLUDE PROFILES ETC.
SEE VERTICAL FILE #26

SECTION II

LOCAL COOPERATION REQUIREMENTS

2-01. Applicable Portions of Flood Control Act. Section 10 of the Act approved 22 December 1944, which authorized construction of the project works, reads in part as follows:

"Section 10. That the following works of improvement for the benefit of navigation and the control of destructive flood waters and other purposes are hereby adopted and authorized.....

BUTTE CREEK

The project for the control of floods and other purposes on the Sacramento River, California, adopted by the Acts approved March 1, 1917, May 15, 1928, August 26, 1937, and August 18, 1941, are hereby modified substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 649, Seventy-eighth Congress, Second Session.....

2-02. Project Document. The work included herein is described in House Document No. 649, Seventy-eighth Congress, Second Session, the provision for local cooperation is quoted in part as follows:

"....that local interests provide free of cost to the United States, all necessary rights-of-way, including utility changes and modifications, required for construction of the improvements; maintain and operate all levee and appurtenant works after completion at their own expense; and hold and save the United States free from damages in connection with the completed works."

2-03. Assurances Provided by Local Interests. Assurance of co-operation by local interests is provided by State of California legislation, as contained in Chapter 3, Part 2, Division 5 of the State Water Code.

2-04. Acceptance by and Transfer to the State Reclamation Board. Responsibility for operating and maintaining the completed works of Butte Creek from the Durham-Oroville Road upstream 4.3 miles was officially accepted by the Reclamation Board of the State of California by letter dated 26 January 1959. A portion of the Butte Creek project from the old Highway No. 99E upstream to the Durham-Oroville Road was transferred to the State Reclamation Board by letter dated 8 January 1958, all as shown on copies of letters, Exhibit F.

2-04. The responsibility for operation and maintenance of the completed work of Little Chico Creek from the Diversion Structure downstream to Alberton Road was accepted by The Reclamation Board of the State of California by letter dated 18 February 1971, see EXHIBIT F. ^

Note: 30 May 1985 - Fred Chaimson reported that DWR has agreement with City of Chico to maintain that portion of Little Chico Creek within "old City Limits".

SECTION III

MAINTENANCE AND OPERATION - GENERAL PROCEDURE

3-01. Reference to Approved Regulations. This manual is submitted in accordance with provisions of Title 33 - Navigation and Navigable Waters, Chapter II, Corps of Engineers, Department of the Army, Part 208 - Flood Control Regulations, Maintenance and Operation of Flood Control Works, approved by the Secretary of the Army, 9 August 1944, and published in Federal Register, 17 August 1944, a copy of which is included as Exhibit A, Sheets 1 and 2.

3-02. Intent of Regulations. The general intent of the regulations approved by the Secretary of the Army is stated in paragraph 208.10 (a) (1) as follows: "The structures and facilities constructed by the United States for local flood protection shall be continuously maintained in such a manner and operated at such times and for such periods as may be necessary to obtain the maximum benefits."

The principle mission of the Corps of Engineers, during flood emergencies, is to insure that flood control works are properly operated and maintained and offer technical advice to enable local interests to obtain maximum flood protection. All other matters become secondary and will yield precedence to the accomplishment of the above-stated missions. During flood periods local interests maintain close liaison with the office of the District Engineer, Corps of Engineers. However, in the event it is evident that all available county and local resources are insufficient to cope with the situation and the necessity for an emergency proclamation is anticipated, requests for State assistance in flood fighting should properly be made direct to the Department of Water Resources, which is the State agency designated by the Directors of Public Works, to receive requests from local agencies for assistance in flood fighting. This agency is authorized to request Federal assistance from the Corps of Engineers when State and local resources are insufficient to cope with the situation. Therefore, it is desired to emphasize that requests for Federal assistance in flood fighting should be made only when it is evident that County, State, and/or other local equipment and manpower will be exhausted and local resources are insufficient to cope with the flood emergency situation.

3-03. Purpose of this Manual. In view of the large number of local flood protection projects authorized by Congress and the repetitious nature of regulations to govern maintenance and operation of each individual project, and in order that local interests may be fully aware of the extent of the obligations assumed by them in furnishing assurances of local cooperation for projects to be constructed in the future, the general regulations described above were established by the Secretary of the Army. The general regulations

approved by the Secretary of the Army, August 1944, were intended to be sufficiently broad in scope and general in nature as to be applicable to all flood-protect-projects for which such regulations are required by law. Section 208.10 (a) (10) of the regulations read as follows: "The War Department will furnish local interests with an Operation and Maintenance Manual for each completed project, or separate useful part thereof, to assist in carrying out their obligations under these regulations." This manual has, therefore, been prepared to furnish local interests with information on the project works and advise as to the details of the operation and maintenance requirements applicable to this particular project, to state procedure required by the Department of the Army, and to indicate satisfactory methods of flood-fighting operations and emergency repairs. The project works are to be maintained and operated in accordance with the Flood Control Regulations referred to above and interpretations thereof contained herein.

3-04. Definitions. As used hereinafter, the term "Superintendent" shall be defined to mean the person appointed by local interests to be directly in charge of an organization which will be fully responsible for the continuous inspection, operation, and maintenance of the project works; the term "District Engineer" shall be defined to mean the District Engineer of the Sacramento District, Corps of Engineers, U. S. Army, or his authorized representative. The term "flood" shall mean any flow when the water surface reaches or exceeds the reading of 10.0 on the State Department of Water Resources gaging station located on the right bank of Butte Creek just downstream from the Chico-Oroville bridge crossing. The term "right bank" or "left bank" shall be defined to mean the right or left bank or side, respectively, of a stream or channel when facing downstream.

3-05. General Provisions of Regulations. In addition to that quoted in paragraph 3-02 above, the general provisions of the Flood Control Regulations, contained in paragraphs 208.10(a)(2) to 208.10(a)(9), both inclusive, are quoted as follows:

- "(2) The State, political subdivision thereof, or other responsible local agency, which furnished assurance that it will maintain and operate flood control works in accordance with regulations prescribed by the Secretary of War, as required by law, shall appoint a permanent committee consisting of, or headed by an official hereinafter called the "Superintendent," who shall be responsible for the development and maintenance of, and directly in charge of an organization responsible for the efficient operation and maintenance of all structures and facilities during flood periods and for continuous

inspection and maintenance of the project works during periods of low water, all without cost to the United States.

- (3) A reserve supply of materials needed during a flood emergency shall be kept on hand at all times.
- (4) No encroachment or trespass which will adversely affect the efficient operation or maintenance of the project works shall be permitted upon the rights-of-way of the protective facilities.
- (5) No improvement shall be passed over, under or through the walls, levees, improved channels or floodways, nor shall any excavation or construction be permitted within the limits of the project right-of-way, nor shall any change be made in any features of the work without prior determination by the District Engineer of the Department of the Army or his authorized representative that such improvement, excavation, construction, or alteration will not adversely affect the functioning of the protective facilities. Such improvements or alterations as may be found to be desirable shall be constructed in accordance with standard engineering practice. Advice regarding the effect of proposed improvements or alterations on the functioning of the project and information concerning methods of construction acceptable under standard engineering practice shall be obtained from the District Engineer, or, if otherwise obtained, shall be submitted for his approval. Drawings or prints showing such improvements or alterations as finally constructed shall be furnished the District Engineer after completion of the works.
- (6) It shall be the duty of the Superintendent to submit a semi-annual report to the District Engineer covering inspection, maintenance, and operation of the protective works.
- (7) The District Engineer or his authorized representative shall have access at all times to all portions of the protective works.
- (8) Maintenance measures or repairs which the District Engineer deems necessary, shall be promptly taken or made.

- (9) Appropriate measures shall be taken by local authorities to insure that the activities of all local organizations operating public or private facilities connected with the protective works are coordinated with those of the Superintendent's organization during flood periods."

3-06. Assistance to be Furnished by the District Engineer. The District Engineer will:

a. Furnish to the Superintendent "As Constructed" drawings of the project works at the time they are transferred.

b. Make periodic inspections of the project works and notify the Superintendent of any repairs or maintenance measures which the District Engineer deems necessary in addition to the measures taken by the Superintendent.

c. Submit to the Office, Chief of Engineers, all cases of non-compliance with full details thereof for determination of corrective measures to be taken.

d. Make prior determination that any proposed encroachment, improvement, excavation, or construction within the right-of-way, or alteration of the project works, will not adversely affect the functioning of the protective facilities, and to furnish the Superintendent with an approval thereof in writing.

e. Assist the Superintendent as may be practicable, in his duties of ascertaining storm developments having flood-producing potentialities, assembling flood-fighting forces and materials, and initiating and carrying out flood-fighting operations.

3-07. Responsibilities of the Superintendent. In line with the provisions of the Flood Control Regulations, the general duties of the Superintendent include the following:

a. Training of Key Personnel. Key personnel shall be trained in order that regular maintenance work may be performed efficiently and to insure that unexpected problems related to flood control may be handled in an expeditious and orderly manner. The Superintendent should have available the names, addresses, and telephone numbers of all his key men and a reasonable number of substitutes. These key men should, in turn, have similar data on all of the men who will assist them in the discharge of their duties. The organization of key men should include the following:

- (1) An assistant to act in the place of the Superintendent in case of his absence or indisposition.

- (2) Sector foremen in sufficient number to lead maintenance patrol work of the levee, inspect the channel, and operate the gate structures properly during flood periods. High qualities of leadership and responsibility are necessary for these positions.

b. Files and Records. The Superintendent shall maintain a file of reports, records, and drawings concerning the project works, readily available at all times to the District Engineer.

c. Encroachment or Trespass on Right-of-Way. In accordance with the provisions of Flood Control Regulations 208.10(a)(4), no encroachment or trespass which will adversely affect the efficient operation or maintenance of the project works shall be permitted on the rights-of-way for the protective facilities. The Superintendent will, therefore, cause notices to be posted at conspicuous places along the project right-of-way directing public attention to this regulation. The Superintendent shall arrange for the prosecution of offenders under local ordinances and report action taken to the State Reclamation Board.

d. Permits for Right-of-Entry or Use of Portion of Right-of-Way. Permits for temporary right-of-entry or use of portions of the right-of-way shall not be issued without prior determination by the State Reclamation Board sufficiently in advance of issuance to permit adequate study and consideration and determination of conditions to be embodied in the permit document. Executed copies, in triplicate, of the permit document as issued shall be furnished the State Reclamation Board. See Exhibit G for sample permit of right-of-entry.

e. Permits for Improvements or Construction within the Project Right-of-Way. All requests for permits for construction of any improvements of any nature within the limits of the project right-of-way shall be referred to the District Engineer through the State Reclamation Board for determination that such construction will not adversely affect the stability, safety, and functioning of the protective facilities, and for definition of conditions under which permit should be granted. These conditions will include, among others, the following items:

- (1) That all work shall be performed:

- (a) In accordance with standard engineering practice and in accordance with plans and specifications approved by the District Engineer or his authorized representative; drawings or prints of proposed improvements

or alterations to the existing flood control works must be submitted for approval to the State Reclamation Board sufficiently in advance of the proposed construction to permit adequate study and consideration of the work.

(b) To the satisfaction of the District Engineer.

- (2) After completion of the work, "As Constructed" drawings or prints, in duplicate, showing such improvements as finally constructed shall be furnished the District Engineer.

f. Coordination of local Activities. In accordance with the provisions of Flood Control Regulations, paragraph 208.10(a)(9), the Superintendent will, during periods of flood flow, coordinate the functions of all agencies, both public and private, that are connected with the protective works. Arrangements shall be made with the local law enforcement agencies, street departments, and railroad and utility companies for developing a coordinated flood-fighting program; and an outline of this program shall be filed with the District Engineer.

g. Inspection.

- (1) Flood Control Regulations, paragraph 208.10(b)(1), are quoted in part as follows:

"(b) Levees (1) Maintenance . . . Periodic inspections shall be made by the Superintendent to insure that . . . maintenance measures are being effectively carried out . . . Such inspections shall be made immediately prior to the beginning of the flood season, immediately following each major high water period, and otherwise at intervals not exceeding 90 days and such intermediate times as may be necessary to insure the best possible care of the levee."

- (2) For sake of uniformity, and to the extent practicable, the dates of inspection shall be as follows: 1 November, 1 May, and immediately following each flood flow in excess of a reading of 10.0 on State Department of Water Resources gage located on the right bank of Butte Creek near the Chico-Oroville road crossing.

- (3) The check lists and instructions shown in Exhibit E, Sheets 1 to 8, inclusive, are to be explicitly followed in each inspection to insure that no features of the protective system are overlooked. Check lists locally typed or printed in conformity with sheets 2, 4, and 6, shall have printed on the reverse side the applicable instructions shown on sheets 3, 5, and 8, Exhibit E. Carbon copy of the inspector's original field notes as recorded on the check list shall be transmitted to the District Engineer immediately following each inspection, and one copy included as an inclosure to the semi-annual report as provided in paragraph 3-07(i)(1) of this manual.

h. Maintenance.

- (1) Flood Control Regulations paragraph 208.10 (b)(1) are quoted in part as follows:

"(b)(1) Maintenance. The Superintendent shall provide at all times such maintenance as may be required to insure servcability of the structures in time of flood. Measures shall be taken to exterminate burrowing animals, and to provide for removal of wild growth and drift deposits, and repair of damage caused by erosion or other forces Immediate steps will be taken to correct dangerous conditions disclosed by such inspections. Regular maintenance repair measures shall be accomplished during the appropriate season as scheduled by the Superintendent."
- (2) Full responsibility for making the repairs and the methods used is placed on the Superintendent, but the experience and facilities of the District Engineer will be available to him for advice and consultation.
- (3) All repairs shall be made in accordance with standard engineering practice, to line and grade and in accordance with details shown on the construction drawings for the project works, copies of which are included in Exhibit B. No change or alteration shall be made in any feature of the project works without prior determination by the District Engineer that such alteration

will not adversely affect the stability and functioning of the protective facilities. Plans and specifications of all changes or alterations that may be proposed by the Superintendent shall be submitted to the District Engineer for investigation and approval before prosecution of the work."

1. Reports.

- (1) Semi-Annual Report. In accordance with the provisions of the Flood Control Regulations, paragraph 208.10(a)(6), the Superintendent shall submit within a 10-day period following 1 December and 1 June of each year, a semi-annual report to the District Engineer covering inspection, maintenance, and operation of the protective works. This report will present a statement of:
 - (a) The physical condition of the protective works as summarized from the logs of inspection.
 - (b) Flood behavior of the protective works, and flood-fighting activities during the period.
 - (c) Prosecutions for encroachment or trespass.
 - (d) Permits issued for right-of-way or use of right-of-way.
 - (e) Permits issued for improvements or construction within the project right-of-way.
 - (f) Maintenance measures taken; nature, date of construction, and date of removal of temporary repairs; date of permanent repairs.
 - (g) Fiscal statement of cost and maintenance and operation for the period.

A suggested form for submission of the semi-annual report is included as Exhibit D, Sheets 1 and 2.

SECTION IV

FEATURES OF THE PROJECT SUBJECT TO FLOOD CONTROL REGULATIONS

4-01. Project Works. The Upper Butte Creek Levee Construction and Channel improvements (Part No. 2) covered by this manual consist of setback and enlargement of the locally constructed levees to project standards; channel improvement by enlargement of the channel to the extent necessary to obtain borrow material for levee construction and channel clearing; a diversion structure on Little Chico Creek; a diversion channel from Little Chico Creek to Butte Creek with intermittent levees; stone protection at various locations, irrigation structures and drainage structures from Little Chico Creek downstream along the diversion channel a distance of about 3 miles; thence downstream along Butte Creek a distance of about 7.3 miles to old Highway No. 99E. For further details see drawings of Exhibit B.

4-02. Levees.

a. Description. For location and description of levees covered in this manual; see paragraphs 1-02 and 1-03. Levees have been built to adopted grade and section by new construction with a riverside berm of variable width (30 feet or better), waterside slope of 1 on 3, crown width of 12 feet and landside slope of 1 on 2. The levee crown was surfaced with compacted gravel for a width of 10 feet for patrol road purposes. Access ramps and turnarounds have also been surfaced. For more complete detail of items included in construction of about-mentioned levees, refer to the "As Constructed" drawings of Exhibit B. Structures affecting levee maintenance are listed in Exhibit B. Regulations regarding levee inspection, maintenance and operation will be found in paragraph 4-02 b, c, and d of this manual.

b. Inspection.

- (1) Pertinent Requirements of the Code of Federal Regulations. Flood Control Regulations, paragraph 208.10 (b)(1), are quoted in part as follows:

"(b) Levees - (1) Maintenance . . . Periodic inspection shall be made by the Superintendent . . . to be certain that

- (i) No unusual settlement, sloughing, or material loss of grade of levee cross section has taken place;

- (ii) No caving has occurred on either the land-side or the riverside of the levee which might affect the stability of the levee section;
- (iii) No seepage, saturated areas, or sand boils are occurring;
- (iv) Toe drainage systems and pressure relief wells are in good working condition, and that such facilities are not becoming clogged;
- (v) Drains through the levees and gates on said drains are in good working condition;
- (vi) No revetment work or riprap has been displaced, washed out, or removed;
- (vii) No action is being taken, such as burning grass and weeds, during inappropriate seasons, which will retard or destroy the growth of sod; (see Note (a) at end of subparagraph (1).)
- (viii) Access roads to and on the levee are being properly maintained;
- (ix) Cattle guards and gates are in good condition;
- (x) Crown of levee is shaped so as to drain readily, and roadway thereon, if any, is well shaped and maintained;
- (xi) There is no unauthorized grazing or vehicular traffic on the levees;
- (xii) Encroachments are not being made on the levee right-of-way which might endanger the structure or hinder its proper and efficient functioning during times of emergency. Such inspections shall be made immediately prior to the beginning of the flood season; immediately following each major high water period, and otherwise at intervals not exceeding 90 days; and such intermediate times as may be necessary to insure the best possible care

of the levee..."

Note (a)

Since the growth of sod on the slopes of the levees of this project is not practicable and as the nature of the levee growth warrants burning thereof to facilitate inspection, the provisions of subparagraph b (1) of the regulations inconsistent therewith shall not apply. In place of item (vii), therefore, the following shall be observed:

Weeds, grasses and debris on the levee shall be burned during appropriate seasons where not dangerous or impracticable, in order to permit the detection of cracks, holes, burrows, slips, and other damage and to permit the detection and extermination of burrowing animals and that grass and weeds on levee slopes be mowed where removal by burning is dangerous or impracticable, such as on peat levees or where burning would constitute a hazard.

- (2) To insure the taking of such maintenance measures as will be required for proper functioning of the levee, the following items shall be specifically covered in each inspection:
 - (a) Aggradation or degradation of the stream bed along the toe.
 - (b) Settlement of levee fill.
 - (c) Erosion of levee slopes, both sides of levees.
 - (d) Presence of seepage; saturated areas, or sand boils back of levee.
 - (e) Condition of access roads and roadway on levee.

c. Maintenance.

- (1) Repairs to Levee Embankment. Methods used for repair or reconstruction of the levee fill will depend on the extent of the damaged section. If of small extent, the most suitable method will be to bring the levee back to line and grade by

a fill made in 6-inch layers of earth free from brush, roots, sod or other unsuitable material, If of larger extent, the fill should be made in the same manner as the original construction, of selected material from borrow pits approved for the project, placed in uniform layers of loose material and not more than 6 inches in depth and compacted in accordance with the specifications under which the work was completed or compacted according to approved construction practices. The Superintendent shall provide at all times such maintenance as may be required to insure serviceability of the levees in time of flood.

- (2) Depredations of Burrowing Animals. Dens and runways formed within the levee by burrowing animals are frequently the causes of levee failures during flood stages. Burrowing animals such as muskrats, ground hogs, ground squirrels, moles and gophers, found in the levee should be exterminated. The dens and runways should be opened up and thoroughly compacted as they are backfilled. Levees kept properly cleared are not seriously menaced by burrowing animals as they prefer areas where a protective cover, such as high grass, weeds, and brush, is found. Several methods of extermination are found effective, such as trapping, baiting, and poison gases, depending on the type of animal present and the time of year the work is done. Advice concerning the best methods in each locality can be obtained from the County Agricultural Agent.
- (3) Access Roads. Access roads to the levees shall be maintained in such condition that they will be accessible at all times to trucks used to transport equipment and supplies for maintenance of flood fighting.
- (4) Burning. Along reaches of the levee where the practice of burning weeds, grasses and debris is conducted, extra precaution shall be taken to prevent fires from reaching asphaltic covered pipes and wooden structures. Prior to the time fires are started, all weeds, grasses and combustible materials shall be removed for a distance of at least 3 feet from pipes and

structures that are susceptible to burning. Wet sacks or water sprays should be made available to workmen to prevent fires from reaching inflammable structures.

d. Operation.

- (1) Pertinent Requirements of the Code of Federal Regulations. Flood Control Regulations, Par. 208.10 (b)(2) are quoted in part as follows:

"(2) Operation. During flood periods, the levee shall be patrolled continuously to locate possible sand boils or unusual wetness of the landward slope to be certain that:

"(1) There are no indications of slides or sloughs developing;

(ii) Wave wash or scouring action is not occurring;

(iii) No low reaches of levee exist which may be overtopped;

(iv) No other conditions exist which might endanger the structures.

Appropriate advance measures will be taken to insure the availability of adequate labor and materials to meet all contingencies. Immediate steps will be taken to control any condition which endangers the levee and to repair the damaged section."

- (2) It shall be the duty of the Superintendent to maintain a periodic patrol of the project works during all periods of flood flow in excess of a reading of 10.0 on the State Department of Water Resources gage located on the right bank of Butte Creek just downstream from the Chico-Oroville bridge crossing, and to maintain a store of supplies and equipment available for emergency flood fighting operations and emergency repairs. In this connection, attention is invited to Section V of this manual for suggested methods of combating flood conditions. The Superintendent shall cause readings to be taken of the State Department of Water Resources staff

gage, or at a more accessible gage if properly correlated with stream discharge, at intervals of two to four hours during the time when the water surface is above flood stage, noting the time of observations. These readings shall be entered in the log of flood observations, one copy of which shall be forwarded to the District Engineer immediately following the recession of the flood, and one copy transmitted as an inclosure to the semi-annual report, as provided in paragraph 3-07 (1) (1) of this manual.

- (3) Gaps remain in the levee at several highway and railroad bridge approaches. These will require sandbagging during flows which will overtop the approaches. For location of these gaps and conditions under which sandbagging will be required see Exhibit H of this manual.

4-03. Channels and Floodways.

a. Description.

- (1) Little Chico Creek to Butte Creek Channel. The Little Chico Creek to Butte Creek diversion channel consists of the following: a converging trapezoidal channel with bottom width of 100 feet and side slopes of 1 on 3 at centerline station 10+20.5 and bottom width of 30 feet and side slopes of 1 on 2 from centerline stations 13+20.5; a trapezoidal channel with bottom width of 30 feet and side slopes of 1 on 2 from centerline stations 13+20.5 to 66+85; a natural channel following an existing slough from centerline stations 66+85 to 103+50; and a trapezoidal channel with a 40' bottom width and 1 on 2 side slopes from centerline station 103+50 to its confluence with Butte Creek at centerline station 161+21. The total distance is about 3 miles. For further details and location of stations see drawings of Exhibit B.
- (2) Butte Creek Channel. Channel improvement on Butte Creek from its junction with the Diversion Channel to its downstream end, a distance of about 7.3 miles, consist principally of clearing in the channel between the levees and channel enlargement incidental to removal of borrow for levee construction. At a few locations degrading

- (3) The Little Chico Creek Channel as improved in 1970.
The cleared channel of Little Chico Creek extends from the Diversion Structure downstream a distance of about 8.5 miles to Alberton Road (see EXHIBIT A-1). Channel improvements on Little Chico Creek consist generally of clearing of brush and debris from the channel in the reach between Alberton Road and Bruce Road to increase the non-damaging capacity of the stream through the city of Chico to an estimated 3,000 cubic feet per second. Vegetation growth in the above described reach is to be controlled by hand methods to the fullest extent. If herbicides are used, such use would be limited to spot application (back-pack method) under carefully controlled conditions. Live trees, with diameters greater than 6 inches, left standing after completion of the contract listed in paragraph 1-05 c. shall not be removed during normal maintenance operation. [Regulation regarding inspection, maintenance and operation of channels and floodways will be found in paragraphs 4-03 b., c. and d. of this manual.
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WORK ACCOMPLISHED IN 1970
ALBERTON ROAD TO TAFFEE AVE
BRUSH CLEAR'G

TAFFEE AVE TO CROUCH AVE
INTERMITTENT BRUSH CLEAR'G
CROUCH AVE TO OAK STREET
CONTINUOUS BRUSH & DEBRIS
CLEAR'G

BOUCHER STREET TO FOREST AVE. (PAST OF 99)
INTERMITTENT BRUSH & DEBRIS
CLEAR'G

D.S. OF BRUCE. (PAST OF 99)
BRUSH CLEAR'G

of the channel was accomplished to remove restrictions and to improve channel alignment. As shown on the drawings of Exhibit B, part of the channel not required for borrow or flow of water at low stages, is grazing land or cultivated land used for production of seasonal crops. Regulations regarding inspection, maintenance and operation of channels and floodways will be found in paragraphs 4-03b, c and d of this manual.

(3)
b. Inspection.

- (1) Pertinent Requirements of the Code of Federal Regulations. Flood Control Regulations, paragraph 208.10 (g)(1) are quoted in part as follows:

"(g) Channels and floodways...(1) Maintenance. Periodic inspections of improved channels and floodways shall be made by the Superintendent to be certain that: ✓

- (i) The channel or floodway is clear of debris, weeds, and wild growth;
- (ii) The channel or floodway is not being restricted by the depositing of waste materials, building of unauthorized structures or other encroachments;
- (iii) The capacity of the channel or floodway is not being reduced by the formation of shoals;
- (iv) Banks are not being damaged by rain or wave wash, and that no sloughing of banks has occurred;
- (v) Riprap sections and deflection dikes and walls are in good condition;
- (vi) Approach and egress channels adjacent to the improved channel or floodway are sufficiently clear of obstructions and debris to permit proper functioning of the project works.

Such inspections shall be made prior to the beginning of the flood season and otherwise at intervals not to exceed 90 days. Immediate steps will be taken to remedy any adverse conditions disclosed by such inspections...."

- (2) The purpose of the flood-flow channels inspection is to insure that conditions which affect the channel capacity will remain the same, as far as possible, as those considered in the design assumptions and that no new conditions develop that may affect the stability of the project structures. At each inspection required by Par. 208.10 (g)(1) of the Flood Control Regulations, particular attention will, therefore, be given the following:

- (a) Location, extent and size of vegetal growth.
- (b) Unauthorized operations within the flood-flow channel right-of-way, such as excavations, buildings, and other structures, levees, bank protection, or training dikes.
- (c) Rubbish and industrial waste disposal.
- (d) Changes in the channel bed such as aggradation or degradation, which would interfere with free-flow from side drainage structures or induce local meanders that would scour the banks.
- (e) Operations of any nature upstream from the project that would affect flow conditions within the limits of the flood control project.
- (f) Condition of project structure.

1. Channel walls;

- a. Deviation from alignment and grade.
- b. Development of cracks and spalls.
- c. Mechanical injuries.

- 2. Fencing.
 - a. Injuries to post, fencing or barbed wire.
 - b. Damage to galvanizing.
 - 3. Earth fills:
 - a. Settlement.
 - b. Erosion of both slopes.
 - c. Excessive seepage or saturation area back of fills.
 - d. Condition of bank protection - concrete or stone blanket.
 - 4. Right-of-way:
 - a. Presence of dumped refuse.
 - b. Encroachment or trespass.
- (3) No excavation within the limits of this unit of the Butte Creek Project will be permitted unless an excavation permit has been approved by the State Reclamation Board.
- (4) If any work is done to improve flow conditions in Butte Creek or the Diversion Channel, it should be coordinated with the District Engineer to insure that proper provisions are made for channel alignment and capacity to conform to the existing project.
- (5) The intent of these inspections is to disclose all conditions which in any way affect the stability of the structures and their functioning for the control of floods. Each inspection report should note and comment on any repair measures that have been taken since the last inspection. In making these inspections, the check sheets included as Exhibit E, shall be explicitly followed.

c. Maintenance.

- (1) Pertinent Requirements of the Code of Federal Regulations. Flood Control Regulations, Par 208.10 (g)(1) are quoted in part as follows:
"....Immediate steps will be taken to remedy any adverse conditions disclosed by such inspection...."
- (2) Shoaling or aggradation at the inlets or outlets of side drainage structures may render them inoperative. It is, therefore, imperative that all drains be kept open and unobstructed at all times.
- (3) Dumped rock or other suitable types of protection should be placed at locations found by experience to be critical trouble points, with a view to stabilizing the channel alignment and preserving the general uniformity of the bank lines.
- (4) Sediment and debris plugs or other obstructions should be removed from the channel to prevent any tendency for the flows to be deflected within the channel. The heavy material likely to accumulate in the new channel at the mouths of tributaries should be removed to keep the channel clear.
- (5) The channel and right-of-way shall be kept reasonably clear of debris, refuse matter, or industrial wastes.
- (6) Weeds and other vegetal growth in the channel shall be cut in advance of the flood season and together with all debris, removed from the channel.
- (7) All eroded concrete shall be repaired as soon as any reinforcing steel is exposed or erosion approaches a depth of 4 inches. For this purpose, it is recommended that the repair be made by thoroughly cleaning the surface by sandblasting and building up the section with pneumatically placed Portland cement mortar. All evidence of settlement, uplift, or failure of concrete structures shall be referred to the State Engineer for analysis and remedial measures.

- (8) All damage to fencing, whether resulting from accidental or willful injuries or from corrosion, shall be promptly repaired with new material in order to maintain satisfactory protection to the public

d. Operation.

- (1) Pertinent Requirements of the Code of Federal Regulations. Par. 208.10 (g)(2) are quoted in part as follows:

"(g) Channels and floodways....(2) Operation. Both banks of the channel shall be patrolled during periods of high water....Appropriate measures shall be taken to prevent the formation of jams....of debris. Large objects which become lodged against the bank shall be removed. The improved channel or floodway shall be thoroughly inspected immediately following each major high water period. As soon as practicable thereafter all snags and other debris shall be removed and all damage to....walls, drainage outlets or other flood control structures repaired."

4-04. Drainage and Irrigation Structures.

a. Description. Drainage and irrigation structures which extend through the levees are listed as follows:

Location Station	Bank	Size And Kind of Pipe	Other Description	Elev. of Invert of Pipe
379+98	Right	24" C.M.P.		135.5
374+90	"	30" C.M.P.		132.0
338+04	"	24" C.M.P.		134.9
321+20	"	24" C.M.P.		140.7
309+11	"	14" Steel		146.0
304+10	"	24" C.M.P.		143.4
226+54	"	36" C.M.P.	Riser Unit L.S.	156.5
215+65	"	24" C.M.P.	Riser Unit W.S.	164.3
215+46	"	30" C.M.P.	" " "	165.0
165+60	"	30" C.M.P.	" " "	174.0
145+53	"	12" Steel	Pipe encased in concr	231.0
132+00	"	2-54" C.M.P.	Riser Unit W.S. Edgar Slough 2-Riser Units W.S.	226.5
126+91	"	24" C.M.P.	Riser Unit W.S.m	183.0
106+93	"	24" C.M.P.	" " "	190.5
94+76	"	8" Steel	" " "	202.0
93+78	"	24" C.M.P.		188.5
73+27	"	8" Steel		206.7
65+52	"	6" Steel		209.0
37+10	"	24" C.M.P.	Standpipe L.S.	217.0
36+85	"	24" C.M.P.		210.2
8+30	"	42" C.M.P.	Riser Unit W.S.	223.5
2+68	Left	42" C.M.P.	" " "	219.5
5+92	"	36" C.M.P.	" " "	219.5
205+60	"	24" C.M.P.	" " "	220.0
324+50	"	36" C.M.P.	Riser Unit W.S.	167.2
368+17	"	30" C.M.P.	" " "	162.7
381+36	"	24" C.M.P.	Riser Unit W.S.	154.0
381+42	"	24" C.M.P.	Riser Unit W.S.	160.0
470+00	"	2-36" C.M.P.	2-Riser Units W.S.	141.0

Note on abbreviations:

C.M.P. = Corrugated Metal Pipe
L.S. = Landside

W.S. = Waterside

On the right bank stations start at the lower end and progress going upstream. On the left bank stations start at the upper end and progress going downstream. Location of the structures listed above may be found in the "As Constructed" drawings of Exhibit B.

b. Inspection.

- (1) Pertinent Requirements of the Code of Federal Regulations. Flood Control Regulations, paragraph 208.10 (d)(1), are quoted in part as follows:

"(d) Drainage Structures (1) Maintenance - Adequate measures shall be taken to insure that inlet and outlet channels are kept open and that trash, drift, or debris is not allowed to accumulate near drainage structures. Flap gates and manually operated gates and valves on drainage structures shall be examined, oiled and trial operated at least once every 90 days..... Periodic inspections shall be made by the Superintendent to be certain that:

- (i) Pipes, gates, operating mechanism, riprap and headwalls are in good condition;
- (ii) Inlet and outlet channels are open;
- (iii) Care is being exercised to prevent the accumulation of trash and debris near the structures and that no fires are being built near bituminous coated pipes;
- (iv) Erosion is not occurring adjacent to the structures which might endanger its water tightness or stability.

Immediate steps will be taken to repair damage, replace missing or broken parts, or remedy adverse conditions disclosed by such inspections."

(2) At each inspection required by paragraph 4-02 (b)(2) of the Standard Manual, the following items, if applicable, shall be particularly noted:

- (a) Debris or other obstructions to flow.
- (b) Condition of pipes and gates.
- (c) Damage or settlement of pipe.
- (d) Condition of concrete-cracks, spall, erosion.

c. Maintenance.

- (1) All eroded concrete shall be repaired as soon as erosion reaches a depth of 4 inches or any reinforcing steel is exposed. For this purpose it is recommended that the repair be made by thoroughly cleaning the surface by sandblasting and building up the concrete to its original section with pneumatically-placed portland cement mortar. All evidences of settlement, uplift, or failure of concrete structures should be referred to the State Engineer for analysis and recommendation of remedial measures.
- (2) If the inspection shows that the automatic drainage structures have been jammed in an open position by debris or other obstructions, they shall be thoroughly cleaned so that they swing freely to a true closure. If any parts of the gates have been damaged or broken, they shall be replaced by new parts.
- (3) Compliance with the provisions prescribed above pertaining to drainage structures is essential for proper maintenance of the levee system covered by this manual. Levee failures caused by neglected drainage structures are of common occurrence; it is, therefore, of utmost importance that these structures always be kept in perfect working condition in accordance with the regulations.
- (4) Care should be taken not to bury any of the side drainage inlets in the event that it

becomes necessary to fill any of the levee. Plans for the maintenance of drainage facilities at any such points should be submitted to the State Reclamation Board for approval before such work is started.

d. Operation.

- (1) Pertinent Regulations of the Code of Federal Regulations. Flood Control Regulations, paragraph 208.10 (d)(2) are quoted in part as follows:

"(2) Operation. Whenever high water conditions impend, all gates will be inspected a short time before water reaches the invert of the pipe and objects which might prevent closure of the gate shall be removed. Automatic gates shall be closely observed until it has been ascertained that they are securely closed....All drainage structures in the levee shall be inspected frequently during floods to ascertain whether seepage is taking place along the lines of their contact with the embankment. Immediate steps shall be taken to correct any adverse conditions."

- (2) The outlets of side drainage structures inundate at relatively low river states. They should, therefore, be inspected at the first sign of a rise in the river to make certain that the gates are not jammed in an open position and thus allow flood waters to enter behind the levee.

4-05. Little Chico Diversion Structure.

a. Description. A concrete diversion structure is located on Little Chico Creek at the head of the Little Chico Creek to Butte Creek Diversion Channel as shown on the Location Map, Exhibit A-1 and drawings of Exhibit B. The portion of the diversion structure which controls the flow downstream to Little Chico Creek consists of a reinforced concrete structure with four openings each 4 feet wide by 9 feet high and invert at streambed. This structure passes all upstream low water flows (up to about 900 c.f.s.) downstream to Little Chico Creek. The portion of the diversion structure which controls the flow downstream to the diversion channel consists of an ungated concrete ogee weir 100 feet long with crest 4 feet

above the upstream streambed. Baffle blocks are provided on the downstream concrete apron to reduce velocities before the water enters the diversion channel. Wing levees on each end of the diversion structure tie the structure to high ground. During the project design flow of 6,700 c.f.s. in Little Chico Creek upstream from the structure, the flow downstream into Little Chico Creek is controlled to a non-damaging flow of 2,200 c.f.s. and the remainder of the flow of 4,500 c.f.s. passes over the ogee weir downstream to the diversion channel. A freeboard of 2.5 feet is provided at the concrete structure and 3.0 feet at the wing levees. Stop log slots, 7 inches wide, are provided in the two end openings of the Little Chico Creek portion of the diversion structure. However, stop logs are not to be used unless, during the project design flow, the distribution of flow downstream to Little Chico Creek exceeds the estimated 2,200 c.f.s. and then only sufficient stop logs will be used to control the flow to 2,200 c.f.s.

- b. Inspection. See paragraph 4-04 b. of this manual.
- c. Maintenance. See paragraph 4-04 c. of this manual.
- d. Operation. See paragraph 4-04 d. of this manual.

4-06. Miscellaneous Facilities.

a. Description. Miscellaneous structures or facilities which were constructed as a part of, or existed in conjunction with, the protective works, and which might affect their functioning, include the following:

- (1) Road Crossings and Bridges to be maintained by the County of Butte, State or appropriate railroad company.
 - (a) Old Highway No. 99E bridge across Butte Creek at centerline Station 393+83
 - (b) The Southern Pacific Railroad bridge across Butte Creek at centerline Station 392+53.
 - (c) The Sacramento Northern Railroad bridge across Butte Creek at centerline Station 346+19.
 - (d) The Durham-Oroville Road bridge across Butte Creek at centerline Station 225+67.

- (e) The Chico-Oroville Road bridge across Butte Creek at centerline Station 95+70.
 - (f) The Southern Pacific Railroad bridge - Sterling City Branch - across Butte Creek at centerline Station 150+00.
 - (g) The new Highway No. 99E bridge across Butte Creek at centerline Station 32+65.
 - (h) A new county highway bridge across the diversion channel at centerline Station 51+80.
 - (i) A new county highway bridge across the diversion channel at centerline Station 105+40.
 - (j) A new railroad bridge across the diversion channel at centerline Station 149+85.
 - (k) Low water crossings on the Diversion Channel at centerline Stations 13+50, 42+00, 53+00, 111+10 and 115+75. These low water crossings are to be maintained by local interests.
- (2) Utility Crossings. Because of the nature of the construction of the levee by local interests, records of utility relocations are not available. Siphon crossings and other utility crossings are to be maintained and operated by the respective owners.
- (3) Hydrographic Facilities. A continuous water stage recorder and staff gage on Butte Creek near the Chico-Oroville bridge crossing. This station to be maintained by the State Department of Water Resources.
- (4) A dam in the vicinity of the Southern Pacific Railroad Bridge (Sterling Branch) to be maintained by the Durham Mutual Water Company.
- (5) The Adams dam located on Butte Creek in the reach between the S.P. Railroad crossing and the Durham-Oroville Road bridge. This dam to be maintained by the local owners.

b. Inspection and Maintenance.

- (1) Pertinent Requirements of the Code of Federal Regulations. Flood Control Regulations, paragraph 208.10 (h)(1) are quoted in part as follows:
 - (h) Miscellaneous Facilities. (1) Maintenance. Miscellaneous structures and facilities constructed as a part of the protective works and other structures and facilities which function as a part of, or affect the efficient functioning of the protective works, shall be periodically inspected by the Superintendent and appropriate maintenance measures taken. Damaged or unserviceable parts shall be replaced without delay....."
- (2) Inspection of the miscellaneous facilities shall be made at the same time that the inspection of the other features of the project are made, and shall be reported on check list No. 3, sheet No. 4 of Exhibit E.
- (3) The interest of the Corps of Engineers and the responsibility of the local interests in the existing highway and railroad bridges is confined to their effect on the safety and functioning of the flood control channel, but any conditions noted in the inspections that may affect them in any way should, as a matter of courtesy, be brought to the attention of the agencies maintaining and operating them. If the inspection of any miscellaneous structure, either existent or constructed in the future under permit, discloses any condition that indicates the probability of failure during periods of high water, the Superintendent shall address a letter to the owner of the structure, quoting this manual as authority and inviting attention to the conditions observed and requesting that immediate steps be taken to correct them. A copy of such letter shall be forwarded to the District Engineer for his information. A report on the action taken by the owner shall be submitted to the District Engineer to accompany the next semi-annual report. A suggested report form is

included as Exhibit D of this manual.

- (4) The purpose of maintenance work is to insure continuous satisfactory operation of equipment. It is, therefore, important in such work that all possible causes of future trouble be found and corrected. Particular attention should be given to minor weaknesses which may be an indication of future trouble.

c. Operation.

- (1) Requirements of the Code of Federal Regulations. Flood Control Regulations, paragraph 208.10 (h)
(2) is quoted as follows:

"(2) Operation. Miscellaneous facilities shall be operated to prevent or reduce flooding during periods of high water. These facilities constructed as a part of the protective works shall not be used for purposes other than flood protection without approval of the District Engineer unless designed therefor."

- (2) On the dam located in the vicinity of the S.P. Railroad bridge (Sterling Branch) flashboards should be ordinarily removed during the period from 1 October to 1 April to afford protection to the dam from floods. The Durham Mutual Water Company will be responsible for operation of this dam.
- (3) On the Adams Dam the flashboards should be removed and the frames collapsed as soon as possible after 30 September to avoid potential damage to the dam from flood waters. The local owners will be responsible for operation of this dam.
- (4) On the dams mentioned in (5) and (6) above, it is understood sufficient water must be passed over the fish ladders to supply the needs for migratory fish as required by the State Fish and Game Commission.

SECTION V

SUGGESTED METHODS OF COMBATING FLOOD CONDITIONS

5-01. Methods Suggested. Most of the methods described herein have been developed during years of experience with the various problems that often come up during periods of high water, and they are not intended to restrict the Superintendent, or others concerned, to a rigid set of rules for every condition that may arise. The remarks are primarily concerned with the earthen portions of the levee system. If problems not covered by these suggestions arise, where the Superintendent is in doubt as to the procedure to be taken, he will be expected to consult the District Engineer, U. S. Engineer Office, Sacramento, California, and follow standard engineering practices in meeting the situation. It should be noted that it is much better to be over-prepared for a "flood-fight" than to find at the last moment that preparations were incomplete or unsatisfactory. Confidence of the protected persons and firms is a valuable asset that should not be carelessly lost through inefficient operation of the protection system in time of emergency.

5-02. Earthen levees. An earthen levee is in danger whenever there is water against it. This danger is directly proportional to the height of the water, the duration of the flood stage, and the intensity of either the current or wave action. The danger is inversely proportional to the cross-sectional area of the levee, the levee's height, and the degree of maintenance. A well constructed levee of proper section should, if maintained and not overtopped, will hold throughout any major flood. However, a serious accident may result in a break. Foundation troubles result in sand boils or a sinking levee, and the local use of unsatisfactory materials causes slides and sloughs. However, such threatened failures can be met if prompt action is taken and proper methods of treatment are used. Wave wash is to be expected whenever the levee is exposed to a wide stretch of open water and is serious if permitted to continue over a considerable length of time.

5-03 Premeditated Damage. The Superintendent should continually guard against premeditated damage to the levee. In the event of an extraordinary flood requiring a fight over long stretches of levee on both sides of the river, there is a natural temptation to relieve the strain by premeditated breaking of the opposite levee.

5-04. Security. Personnel of the Corps of Engineers, whether military or civilian, are not vested with any civil police authority in the performance of their engineering duties, and they will not attempt to exercise any such authority. The responsibility for protecting flood control works against sabotage, acts of depredation,

or other unlawful acts rests with the local interests through local and State Governmental agencies.

5-05. Inspection of Flood Control Works. Immediately upon receipt of information that a high water is imminent, the Superintendent should form a skeleton organization, capable of quick expansion, and assign individuals (Sector Foremen) to have charge of definite sections of levees. As his initial activity, each Sector Foreman should go over his entire sector and parts of adjacent sectors, making a detailed inspection, particularly with reference to the following matters:

- a. Sector limits; ascertain that the dividing line between sectors is plainly determined and, if necessary, marked.
- b. Condition of new levees and recent repairs.
- c. Condition of culverts, flap gates, and sluice gates.
- d. Transportation facilities; roads, rail and water communications.
- e. Material supply; quantity, location, and condition.
- f. Communications; locate and check all necessary telephones in the sector.

5-06. Preliminary Repair Work. After the initial inspection has been made, each Sector Foreman should recruit a labor crew and provide it with tools such as shovels, axes, wheelbarrows, etc. In addition, bulldozers, scrapers, trucks, etc., should be located and made ready for use in case of emergency. Then immediate action should be taken to perform the following work:

- a. Fill up holes or washes in the levee crown, slopes, and landslide berms. Where new construction has been completed during the year, rain washes and deep gullies may have developed. While the levee is new, preparations should be made in advance to combat wave wash along the exposed reaches.
- b. Repair gaps where road crossings have been worn down and the levee is below grade. In filling the road crossings, it may be necessary to obtain material from landside borrow pits, in which case excavation for the material should be kept at least 50 feet from the toe of levee. Any filling done in this connection should be tamped in place and, if in an exposed reach, subject to wave wash, the new section should be faced with bags of sand.
- c. Repair and close all flap gates on culverts and see

that they are seated properly before they are covered with flood waters.

d. Ascertain that all roads to and along the levee are in a good state of repair. The Superintendent should obtain assistance from the county road forces to have all roads put in first-class condition.

e. Locate necessary tools and materials (sacks, sandbags, brush, lumber, lights, etc.), and distribute and store the same at points where active maintenance is anticipated.

f. Check and obtain repair of all telephone lines necessary for operation, obtain lists of all team forces, motorboats, motor cars, and truck transportation that can be made available.

g. Make thorough arrangements with reliable citizens of the community for the supply transportation, subsistence, and shelter for the necessary labor.

h. Communicate directly with owners of all stock pastured on the levee and direct that all stock be removed from the levee right-of-way. Cut all fences crossing the levee that do not have gates provided.

i. Investigate all drainage ditches on the landside of the levee and open these drains when obstructions exist. Prepare to cut the necessary seep drainage ditches; however, no attempt should be made to drain the levee slope until actual seepage takes place.

j. Remove all dynamite and explosives of any kind from the vicinity of the levee.

5-07. Disaster Relief. It is the responsibility of local, state, municipal authorities, supported by and/or working in connection with the American Red Cross to adopt measures for the relief of flood disaster victims. Relief measures can be undertaken by the Department of the Army through its Army Area Commander under existing Army Regulations, but such measures will be undertaken only as a last resort, in extreme cases and under compelling circumstances where local resources are clearly inadequate to cope with the situation.

5-08. Flood Fight. After the above preliminary organization and precautions have been completed, the "flood fight" itself commences. The methods of combating various defects in the earthen levee described in the following paragraphs have been proved

effective during many years of use by the Department of the Army.

a. Drainage of slopes. This work can be done economically while awaiting developments and will serve to make the levees more efficient. Crews should be organized to cut seep drains at all places on the levee and berm when seepage appears. The drains should be V-shaped, no deeper than necessary, and never more than 6" deep. Care must be taken not to cut the sod unnecessarily. In all instances, drains should be cut straight down the levee slope or nearly so. Near the toe of the slope the small drains should be Y'd together and led into larger drains, which, in general, should lead straight across the landside berm into the landside pits or nearest natural or artificial drain.

b. Sand boils. These danger spots are serious if discharging material. The common method of controlling sand boils consists of walling up a watertight sack ring around the boil up to a height necessary to reduce the velocity of flow to a point at which material is no longer discharged from the boil. See Exhibit "C" Plate 1. The sack ring around the boil should be large enough to protect the defective area immediately surrounding the boil. If several boils of sufficient force to displace sand are observed a sack sublevee may be built around the entire nest of boils, rising to such a height that none of the boils will discharge with enough force to displace sand.

c. Wave Wash. The Superintendent and Sector Foremen should study the levee beforehand to determine the possibility of wave wash. All such reaches will be located well in advance and for use in emergency, a reserve supply of filled sacks and rolls of cotton bagging will be kept on board flats. If the slope is well sodded, a storm of an hour's duration should cause very little damage. During periods of high wind and high water, ample labor should stand by and experienced personnel should observe where the washouts are beginning by sounding or by actually wading along the submerged slope. Sections of cotton bagging should be placed over the washed areas, as shown on Exhibit "C", Plate 3. As an alternative, filled sacks should be placed in the cut in an effective manner and as soon as possible. The filled sacks should be laid in sections of sufficient length to give protection well above the anticipated rise. Bagging so laid must be thoroughly weighted down to be effective. Plate 2, Exhibit "C" shows a movable type of wave wash protection, also used with good results. Its advantage is that it can rapidly be built at any convenient place and easily set in place on the job.

d. Scours. A careful observation should be made of the riverside of the levee at all localities where a current of more than two feet per second is observed, or where the profiles show a

high water slope of two feet per mile or greater. Trouble may be looked for at the ends of old levee dikes, road-crossing ramps, old traverses, and places where pipes, sewers and other structures penetrate the levee. If any sign of scour is observed in the pits or at the ends of the dikes, soundings should be taken to observe the amount and progress of the scour. The approved method of construction to check scour in the pits, on the slopes, or at the ends of dikes will be to construct deflection dikes using brush, treetops, or lumber, driving stakes and wiring together, and filling in between with brush and filled sacks or stone.

e. Caving bank protection. As protection against active caving of riverbanks, rock-filled cribs are very effective if properly placed. Cribs are usually 14 by 14 feet in plan by 10 to 14 inches in inside depth. The cribs are constructed on a double thickness of 1" x 4" x 14' lumber, equivalent to 2" x 4" pieces, lapped rail fence fashion at all corners and intersections. They are divided into four compartments of about equal area by two perpendicular cross walls constructed in the same manner as the side walls. The floors and covers are built up of double 1" x 4" boards spaced about 9" center to center. Under the floor and perpendicular to the direction of the floor boards are five equally spaced pairs of 1" x 4" boards spaced about 3 feet center-to center. On top of the cover, perpendicular to the direction of the cover boards, are three pairs of top boards, one over each of the side walls and one over the central division wall. All intersections are nailed with one 20d nail. The compartments are filled with rock before covering. Each wall intersection of the fabricated cribs is securely fastened by a loop of No. 9 wire. See Exhibit "C", Plate 4.

5-09. Topping. Immediate consideration should be given the grade line of each levee section by comparison of existing grades with those shown on the drawings, Exhibit "B". If any reaches show a grade below the previous highest water, emergency topping should be undertaken at once to such a grade as may be established by the District Engineers, U. S. Engineer Office, Sacramento, California, as follows:

a. Sack topping. Sack topping may be used to raise the crown of the levee about three feet. The sacks should be laid stretcherwise or along the levee for the first layer, crosswise for the second layer, and so on. Sacks should be lapped at least 1/3 either way and well mauled into place. When properly sacked and tamped, one sack will give about three to four inches of topping. If gravel is available it should be used for the front facing so as to avoid washing out.

b. Lumber and sack topping. This is the most commonly used method of raising low reaches in emergencies. In putting on

this topping, as well as other topping, a careful line of levels should be run and grade stakes set in advance. 2" x 4" x 6' stakes should then be driven on the riverside of the crown six feet apart, and 1" x 12" boards nailed to the landside of the stakes. This wall backed with a single tier of sacks, will hold out at least one foot of water. If a second foot is necessary, the layers of sacks will have to be increased in number and reinforced. The stakes should be driven three feet in the ground, and should project out three feet, thus providing, in extreme cases, a three-foot topping if properly braced behind with sacks and earth. In some instances, it may be practicable to back up the planking with tamped earth obtained in the vicinity in lieu of the sacks shown in the drawing, Exhibit "C", Plate 5.

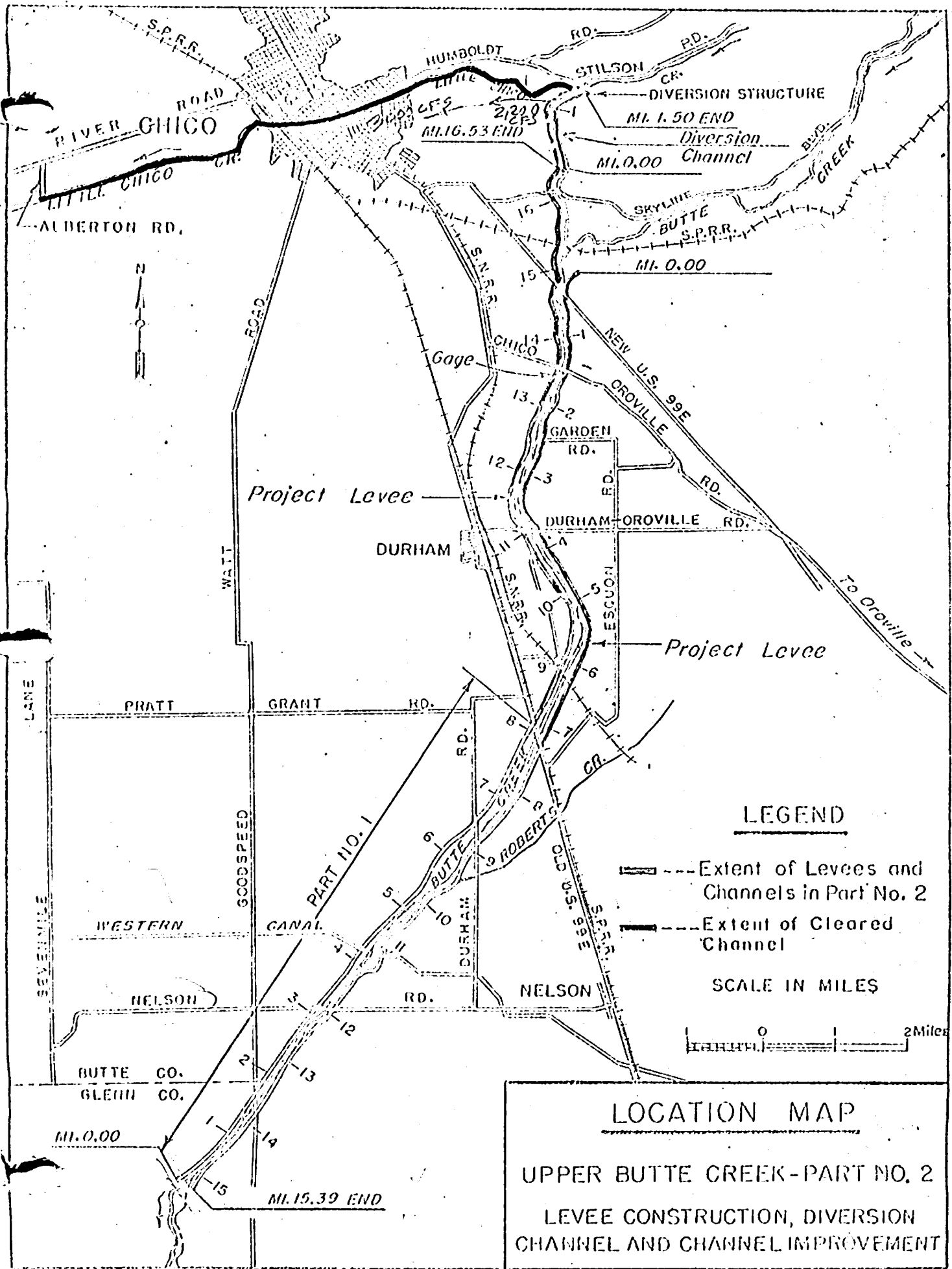
5-10. Transportation. In instances where it is necessary to send equipment over roads that are impassable due to mud or sand, their passage may be provided by the use of a plank road or by means of steel or wire mats. Telephone communication should be provided along dangerous stretches of the levee when travel or other satisfactory means of communication cannot be maintained.

5-11. Use of Government Plant. The District Engineer is authorized to use or loan Government property and plant in cases of emergency where life is in danger and there is no opportunity to secure prior authority suitable private equipment is available, provided that such use is without detriment to the Government.

EXHIBIT A

FEDERAL FLOOD CONTROL REGULATIONS

EXHIBIT A



TITLE 33—NAVIGATION AND NAVIGABLE WATERS

Chapter II—Corps of Engineers, War Department

PART 208—FLOOD CONTROL REGULATIONS MAINTENANCE AND OPERATION OF FLOOD CONTROL WORKS

Pursuant to the provisions of section 3 of the Act of Congress approved June 23, 1936, as amended and supplemented (49 Stat. 1671; 50 Stat. 877; and 65 Stat. 638; 33 U. S. C. 701c-1), the following regulations are hereby prescribed to govern the maintenance and operation of flood control works:

§ 208.10 *Local flood protection works; maintenance and operation of structures and facilities*—(a) *General.* (1) The structures and facilities constructed by the United States for local flood protection shall be continuously maintained in such a manner and operated at such times and for such periods as may be necessary to obtain the maximum benefits.

(2) The State, political subdivision thereof, or other responsible local agency, which furnished assurance that it will maintain and operate flood control works in accordance with regulations prescribed by the Secretary of War, as required by law, shall appoint a permanent committee consisting of or headed by an official hereinafter called the "Superintendent," who shall be responsible for the development and maintenance of, and directly in charge of, an organization responsible for the efficient operation and maintenance of all of the structures and facilities during flood periods and for continuous inspection and maintenance of the project works during periods of low water, all without cost to the United States.

(3) A reserve supply of materials needed during a flood emergency shall be kept on hand at all times.

(4) No encroachment or trespass which will adversely affect the efficient operation or maintenance of the project works shall be permitted upon the right-of-way for the protective facilities.

(5) No improvement shall be passed over, under, or through the walls, levees, improved channels or floodways, nor shall any excavation or construction be permitted within the limits of the project right-of-way, nor shall any change be made in any feature of the works without prior determination by the District Engineer of the War Department or his authorized representative that such improvement, excavation, construction, or alteration will not adversely affect the functioning of the protective facilities. Such improvements or alterations as may be found to be desirable and permissible under the above determination shall be constructed in accordance with standard engineering practice. Advice regarding the effect of proposed improvements or alterations on the functioning of the project and information concerning methods of construction acceptable under standard engineering practice shall be obtained from the District Engineer or, if otherwise obtained, shall be submitted for his approval. Drawings or prints showing such improvements or alterations as finally constructed shall be furnished the District Engineer after completion of the work.

(6) It shall be the duty of the Superintendent to submit a semiannual report to the District Engineer covering inspection, maintenance, and operation of the protective works.

(7) The District Engineer or his authorized representatives shall have access at all times to all portions of the protective works.

(8) Maintenance measures or repairs which the District Engineer deems necessary shall be promptly taken or made.

(9) Appropriate measures shall be taken by local authorities to insure that the activities of all local organizations operating public or private facilities connected with the protective works are coordinated with those of the Superintendent's organization during flood periods.

(10) The War Department will furnish local interests with an Operation and Maintenance Manual for each completed project, or separate useful part thereof, to assist them in carrying out their obligations under these regulations.

(b) *Levees*—(i) *Maintenance.* The Superintendent shall provide at all times such maintenance as may be required to insure serviceability of the structures in time of flood. Measures shall be taken to promote the growth of sod, exterminate burrowing animals, and to provide for routine mowing of the grass and weeds, removal of wild growth and drift deposits, and repair of damage caused by erosion or other forces. Where practicable, measures shall be taken to retard bank erosion by planting of willows or other suitable growth on areas riverward of the levees. Periodic inspections shall be made by the Superintendent to insure that the above maintenance measures are being effectively carried out and, further, to be certain that:

(i) No unusual settlement, sloughing, or material loss of grade or levee cross section has taken place;

(ii) No caving has occurred on either the land side or the river side of the levee which might affect the stability of the levee section;

(iii) No seepage, saturated areas, or sand boils are occurring;

(iv) Toe drainage systems and pressure relief wells are in good working condition, and that such facilities are not becoming clogged;

(v) Drains through the levees and gates on said drains are in good working condition;

(vi) No revetment work or riprap has been displaced, washed out, or removed;

(vii) No action is being taken; such as burning grass and weeds during inappropriate seasons, which will retard or destroy the growth of sod;

(viii) Access roads to and on the levee are being properly maintained;

(ix) Cattle guards and gates are in good condition;

(x) Crown of levee is shaped so as to drain readily, and roadway thereon, if any, is well shaped and maintained;

(xi) There is no unauthorized grating or vehicular traffic on the levees;

(xii) Encroachments are not being made on the levee right-of-way which might endanger the structure or hinder its proper and efficient functioning during times of emergency.

Such inspections shall be made immediately prior to the beginning of the flood season; immediately following each major high water period, and otherwise at intervals not exceeding 90 days; and such intermediate times as may be necessary to insure the best possible care of

the levee. Immediate steps will be taken to correct dangerous conditions disclosed by such inspections. Regular maintenance repair measures shall be accomplished during the appropriate season as scheduled by the Superintendent.

(2) *Operation.* During flood periods the levee shall be patrolled continuously to locate possible sand boils or unusual wetness of the landward slope and to be certain that:

(i) There are no indications of slides or sloughs developing;

(ii) Wave wash or scouring action is not occurring;

(iii) No low reaches of levee exist which may be overtopped;

(iv) No other conditions exist which might endanger the structure.

Appropriate advance measures will be taken to insure the availability of adequate labor and materials to meet all contingencies. Immediate steps will be taken to control any condition which endangers the levee and to repair the damaged section.

(c) *Flood walls.*—(1) *Maintenance.* Periodic inspections shall be made by the Superintendent to be certain that:

(i) No seepage, saturated areas, or sand boils are occurring;

(ii) No undue settlement has occurred which affects the stability of the wall or its water tightness;

(iii) No trees exist, the roots of which might extend under the wall and offer accelerated seepage paths;

(iv) The concrete has not undergone cracking, chipping, or breaking to an extent which might affect the stability of the wall or its water tightness;

(v) There are no encroachments upon the right-of-way which might endanger the structure or hinder its functioning in time of flood;

(vi) Care is being exercised to prevent accumulation of trash and debris adjacent to walls, and to insure that no fires are being built near them;

(vii) No bank caving conditions exist riverward of the wall which might endanger its stability;

(viii) Toe drainage systems and pressure relief wells are in good working condition, and that such facilities are not becoming clogged.

Such inspections shall be made immediately prior to the beginning of the flood season, immediately following each major high water period, and otherwise at intervals not exceeding 90 days. Measures to eliminate encroachments and effect repairs found necessary by such inspections shall be undertaken immediately. All repairs shall be accomplished by methods acceptable in standard engineering practice.

(2) *Operation.* Continuous patrol of the wall shall be maintained during flood periods to locate possible leakage at monolith joints or seepage underneath the wall. Floating plant or boats will not be allowed to lie against or tie up to the wall. Should it become necessary during a flood emergency to pass anchor cables over the wall, adequate measures shall be taken to protect the concrete and construction joints. Immediate steps shall be taken to correct any condition which endangers the stability of the wall.

(d) *Drainage structures.*—(1) *Maintenance.* Adequate measures shall be taken to insure that inlet and outlet channels are kept open and that trash, drift, or debris is not allowed to accumulate near drainage structures. Flap gates and manually operated gates and valves on

drainage structures shall be examined, oiled, and trial operated at least once every 90 days. Where drainage structures are provided with stop log or other emergency closures, the condition of the equipment and its housing shall be inspected regularly and a trial installation of the emergency closure shall be made at least once each year. Periodic inspections shall be made by the Superintendent to be certain that:

(i) Pipes, gates, operating mechanism, riprap, and headwalls are in good condition;

(ii) Inlet and outlet channels are open;

(iii) Care is being exercised to prevent the accumulation of trash and debris near the structures and that no fires are being built near bituminous coated pipes;

(iv) Erosion is not occurring adjacent to the structure which might endanger its water tightness or stability.

Immediate steps will be taken to repair damage, replace missing or broken parts, or remedy adverse conditions disclosed by such inspections.

(2) *Operation.* Whenever high water conditions impend, all gates will be inspected a short time before water reaches the invert of the pipe and any object which might prevent closure of the gate shall be removed. Automatic gates shall be closely observed until it has been ascertained that they are securely closed. Manually operated gates and valves shall be closed as necessary to prevent inflow of flood water. All drainage structures in levees shall be inspected frequently during floods to ascertain whether seepage is taking place along the lines of their contact with the embankment. Immediate steps shall be taken to correct any adverse condition.

(c) *Closure structures.*—(1) *Maintenance.* Closure structures for traffic openings shall be inspected by the superintendent every 90 days to be certain that:

(i) No parts are missing;

(ii) Metal parts are adequately covered with paint;

(iii) All movable parts are in satisfactory working order,

(iv) Proper closure can be made promptly when necessary;

(v) Sufficient materials are on hand for the erection of sand bag closures and that the location of such materials will be readily accessible in times of emergency.

Tools and parts shall not be removed for other use. Trial erections of one or more closure structures shall be made once each year, alternating the structures chosen so that each gate will be erected at least once in each 3-year period. Trial erection of all closure structures shall be made whenever a change is made in key operating personnel. Where railroad operation makes trial erection of a closure structure infeasible, rigorous inspection and drill of operating personnel may be substituted therefor. Trial erection of sand bag closures is not required. Closure materials will be carefully checked prior to and following flood periods, and damaged or missing parts shall be repaired or replaced immediately.

(2) *Operation.* Erection of each movable closure shall be started in sufficient time to permit completion before flood waters reach the top of the structure sill. Information regarding the proper method of erecting each individual closure structure, together with an estimate of the time required by an experienced crew to complete its erection will be given

in the Operation and Maintenance Manual which will be furnished local interests upon completion of the project. Closure structures will be inspected frequently during flood periods to ascertain that no undue leakage is occurring and that drains provided to care for ordinary leakage are functioning properly. Beats or floating plant shall not be allowed to tie up to closure structures or to discharge passengers or cargo over them.

(1) *Pumping plants.*—(1) *Maintenance.* Pumping plants shall be inspected by the Superintendent at intervals not to exceed 30 days during flood seasons and 90 days during off-flood seasons to insure that all equipment is in order for instant use. At regular intervals, proper measures shall be taken to provide for cleaning plant, buildings, and equipment, repainting as necessary, and lubricating all machinery. Adequate supplies of lubricants for all types of machines, fuel for gasoline or diesel powered equipment, and flash lights or lanterns for emergency lighting shall be kept on hand at all times. Telephone service shall be maintained at pumping plants. All equipment, including switch gear, transformers, motors, pumps, valves, and gates shall be trial operated and checked at least once every 90 days. Megger tests of all insulation shall be made whenever wiring has been subjected to undue dampness and otherwise at intervals not to exceed one year. A record shall be kept showing the results of such tests. Wiring disclosed to be in an unsatisfactory condition by such tests shall be brought to a satisfactory condition or shall be promptly replaced. Diesel and gasoline engines shall be started at such intervals and allowed to run for such length of time as may be necessary to insure their serviceability in times of emergency. Only skilled electricians and mechanics shall be employed on tests and repairs. Operating personnel for the plant shall be present during tests. Any equipment removed from the station for repair or replacement shall be returned or replaced as soon as practicable and shall be trial operated after reinstallation. Repairs requiring removal of equipment from the plant shall be made during off-flood seasons insofar as practicable.

(2) *Operation.* Competent operators shall be on duty at pumping plants whenever it appears that necessity for pump operation is imminent. The operator shall thoroughly inspect, trial operate, and place in readiness all plant equipment. The operator shall be familiar with the equipment manufacturers' instructions and drawings and with the "Operating Instructions" for each station. The equipment shall be operated in accordance with the above-mentioned "Operating Instructions" and care shall be exercised that proper lubrication is being supplied all equipment, and that no overheating, undue vibration or noise is occurring. Immediately upon final recession of flood waters, the pumping station shall be thoroughly cleaned, pump house sumps flushed, and equipment thoroughly inspected, oiled and greased. A record or log of pumping plant operation shall be kept for each station, a copy of which shall be furnished the District Engineer following each flood.

(g) *Channels and floodways.*—(1) *Maintenance.* Periodic inspections of improved channels and floodways shall be made by the Superintendent to be certain that:

(i) The channel or floodway is clear of debris, weeds, and wild growth;

(ii) The channel or floodway is not being restricted by the depositing of waste materials, building of unauthorized structures or other encroachments;

(iii) The capacity of the channel or floodway is not being reduced by the formation of shoals;

(iv) Banks are not being damaged by rain or wave wash, and that no sloughing of banks has occurred;

(v) Riprap sections and deflection dikes and walls are in good condition;

(vi) Approach and egress channels adjacent to the improved channel or floodway are sufficiently clear of obstructions and debris to permit proper functioning of the project works.

Such inspections shall be made prior to the beginning of the flood season and thereafter at intervals not to exceed 90 days. Immediate steps will be taken to remedy any adverse conditions disclosed by such inspections. Measures will be taken by the Superintendent to promote the growth of grass on bank slopes and earth deflection dikes. The Superintendent shall provide for periodic repair and cleaning of debris basins, check dams, and related structures as may be necessary.

(2) *Operation.* Both banks of the channel shall be patrolled during periods of high water, and measures shall be taken to protect those reaches being attacked by the current or by wave wash. Appropriate measures shall be taken to prevent the formation of jams of ice or debris. Large objects which become lodged against the bank shall be removed. The improved channel or floodway shall be thoroughly inspected immediately following each major high water period. As soon as practicable thereafter, all snags and other debris shall be removed and all damage to banks, riprap, deflection dikes and walls, drainage outlets, or other flood control structures repaired.

(h) *Miscellaneous facilities.*—(1) *Maintenance.* Miscellaneous structures and facilities constructed as a part of the protective works and other structures and facilities which function as a part of, or affect the efficient functioning of the protective works, shall be periodically inspected by the Superintendent and appropriate maintenance measures taken. Damaged or unserviceable parts shall be repaired or replaced without delay. Areas used for ponding in connection with pumping plants or for temporary storage of interior run-off during flood periods shall not be allowed to become filled with silt, debris, or dumped material. The Superintendent shall take proper steps to prevent restriction of bridge openings and, where practicable, shall provide for temporary raising during floods of bridges which restrict channel capacities during high flows.

(2) *Operation.* Miscellaneous facilities shall be operated to prevent or reduce flooding during periods of high water. Those facilities constructed as a part of the protective works shall not be used for purposes other than flood protection without approval of the District Engineer unless designed therefor, (49 Stat. 1571, 50 Stat. 877; and 55 Stat. 638; 33 U.S.C. 701c; 701c-1) (Regs. 9 August 1944, CE SPEWP)

[SEAL]

J. A. ULIO,
Major General,
The Adjutant General.

[P. R. Doc. 44-12285; Filed, August 18, 1944;
9:44 a.m.]

EXHIBIT "A" Sheet 2 of 2

Book 7

EXHIBIT B

"AS CONSTRUCTED"
DRAWINGS

(See separate folder for the following drawings)

FILE NO.

TITLE

50-4-3350

Channel Improvement and Levee Construction, Little Chico Diversion and Butte Creek from Durham-Oroville Road Upstream 4.3 Miles, Sheets 1 to 33, incl.

50-4-3367 ✓

Channel Improvement and Levee Construction, Butte Creek from Old Highway 99E Upstream to Durham-Oroville Road, Sheets 1 to 14, incl.

50-4-4534

Little Chico Creek, Snagging and Clearing, in 4 sheets.

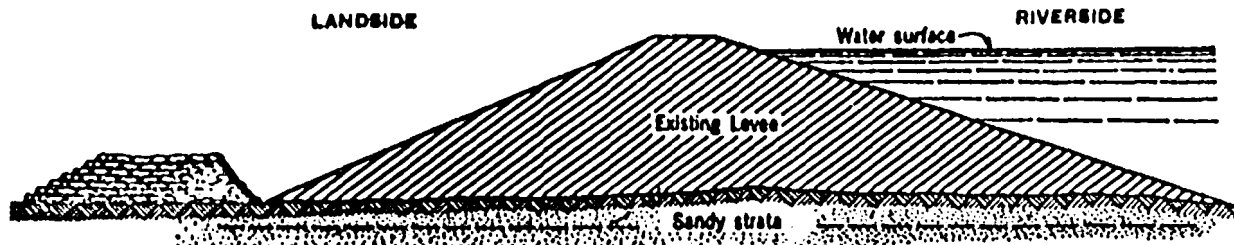
Additional drawings of cross sections, structures and miscellaneous facilities are available in the office of the District Engineer.

EXHIBIT B
Unattached

EXHIBIT C

PLATES OF SUGGESTED FLOOD FIGHTING METHODS

EXHIBIT C



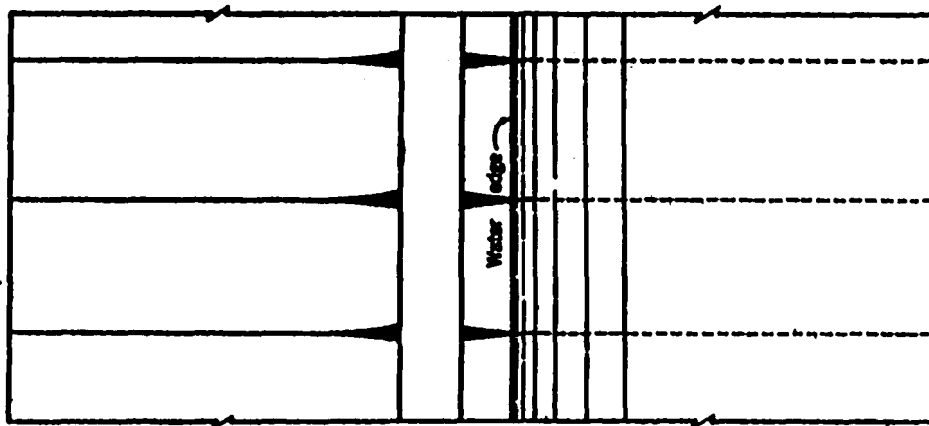
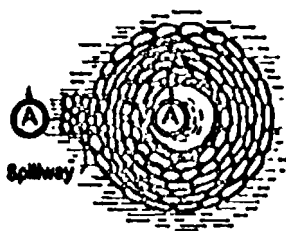
Note:

Bottom width to be no less than 1 1/2 times height.
Be sure to clear sand discharge.
Tie into levee if boil is near toe.

ELEVATION



SECTION A-A



PLAN

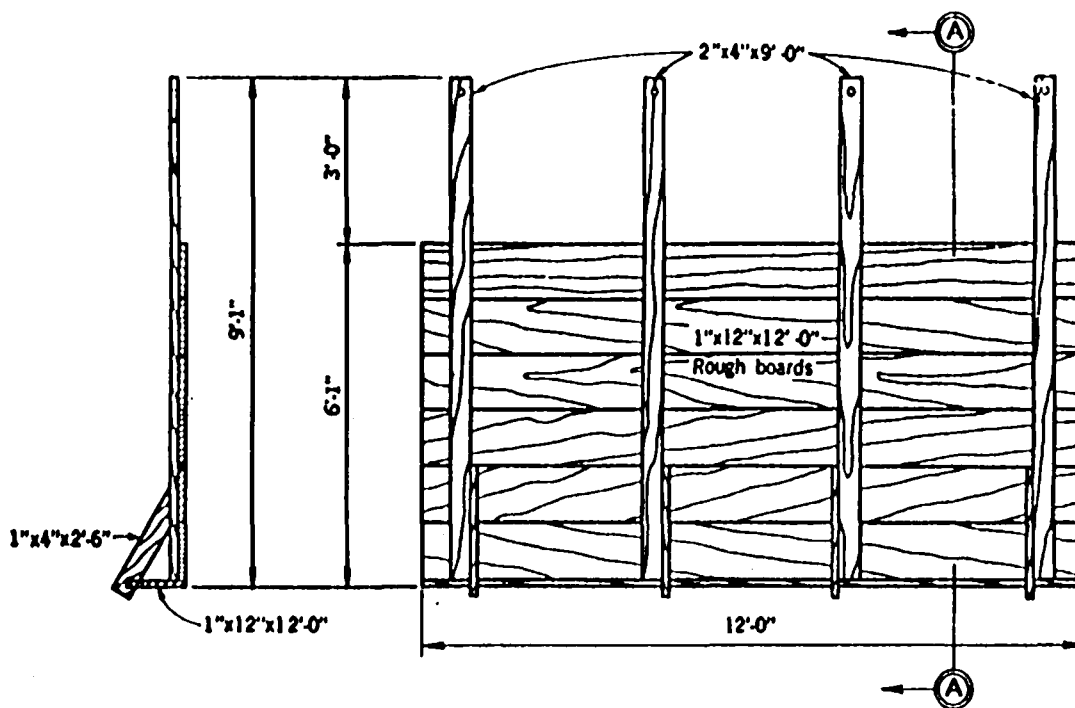
Note:

Do not sack boil which does not put out material.
Height of sack loop or ring should be only sufficient to create enough head to slow down flow through boil so that no more material is displaced and boil runs clear.
Never attempt to completely stop flow through boil.

UPPER BUTTE CREEK

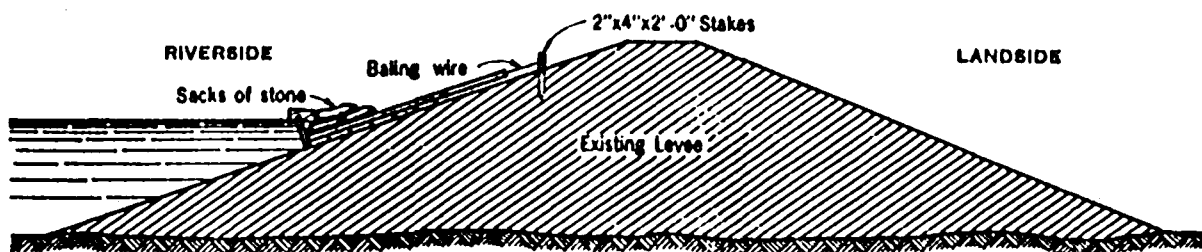
CONTROL OF SAND BOILS

U.S. ENGINEER OFFICE, SACRAMENTO, CALIF.



SECTION A-A

PLAN



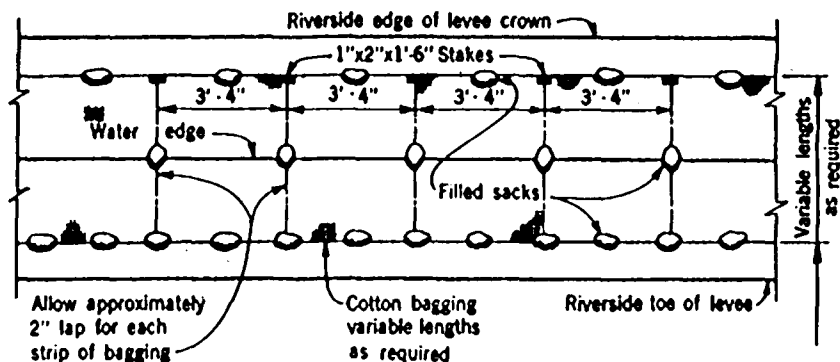
SECTION

BILL OF MATERIAL FOR 100 FEET	
LUMBER	
56 pieces	1"x12"x12'-0"
32 pieces	1"x4"x2'-6"
32 pieces	2"x4"x9'-0"
• 32 pieces	2"x4"x2'-0"
•	(Sharpened)
WIRE	
200'	baling wire
NAILS	
4)	lbs.-8d nails

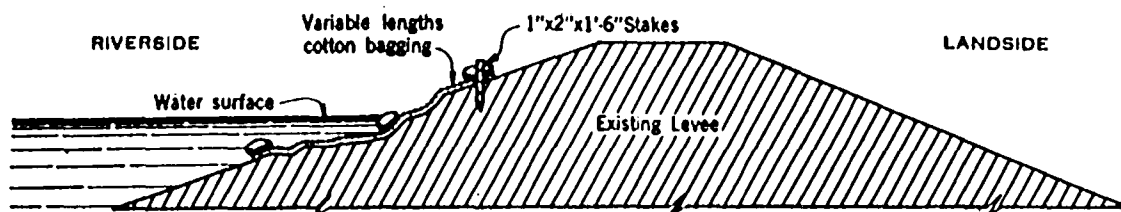
UPPER BUTTE CREEK

MOVABLE WAVE WASH PROTECTION

U.S. ENGINEER OFFICE, SACRAMENTO, CALIF.



PLAN



SECTION

Note:

Lay lengths as required of cotton bagging approximately parallel with levee slope and across damaged section. Weight top and edges of bagging with filled sacks as shown above. The filled sacks should be wired or tied to each strip before laying in place. Stake the corners of each strip above water surface. Where cotton bagging is not available burlap sacking may be substituted.

**MATERIAL REQUIRED FOR 100
LINEAR FEET OF LEVEE**

LUMBER

- 30 Stakes 1"x2"x1'-6"
- (Sharpened)

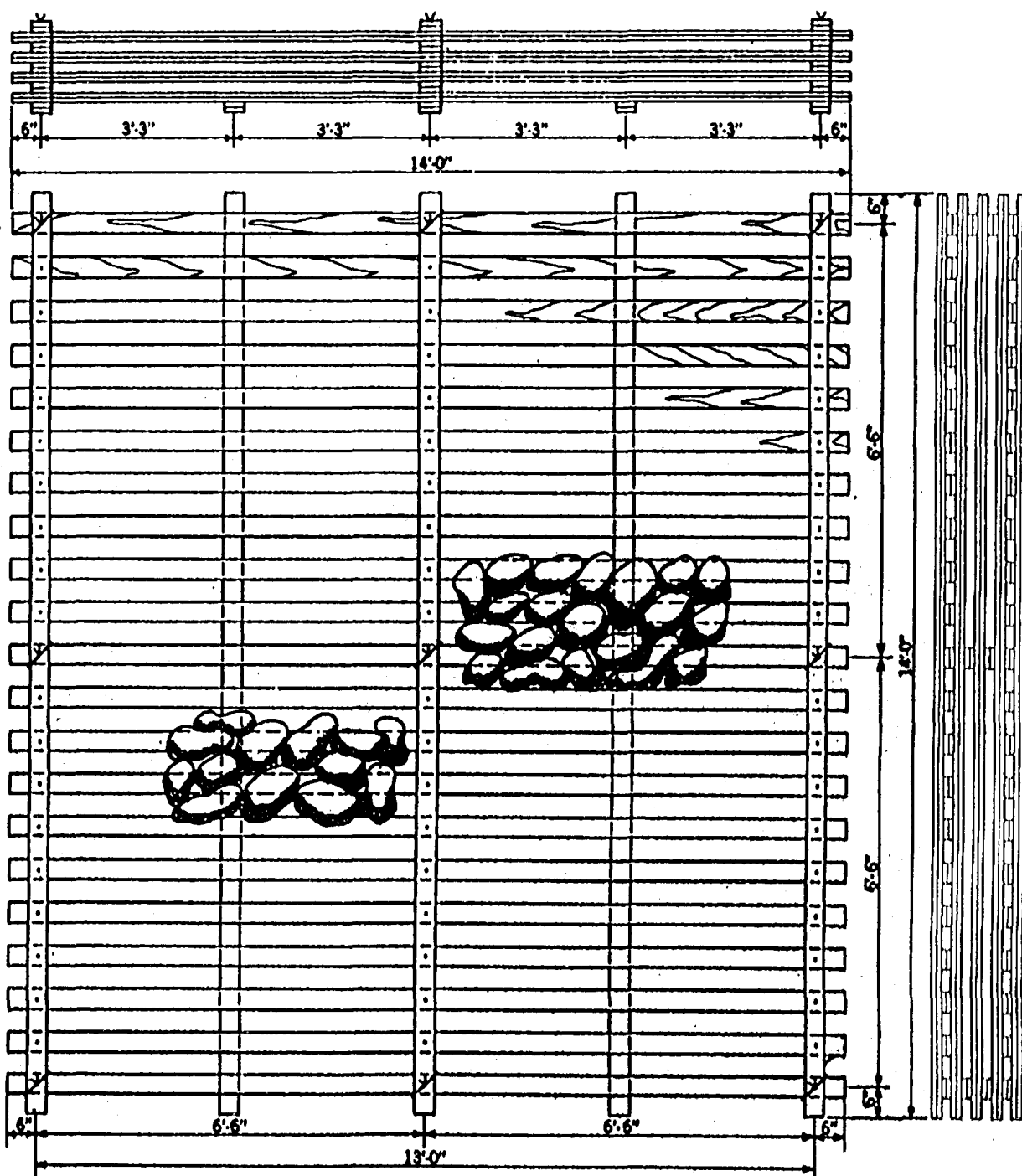
SANDBAGS

120 sand bags
Cotton bagging
as required

UPPER BUTTE CREEK

WAVE WASH PROTECTION

U.S. ENGINEER OFFICE, SACRAMENTO, CALIF.

**Notes:**

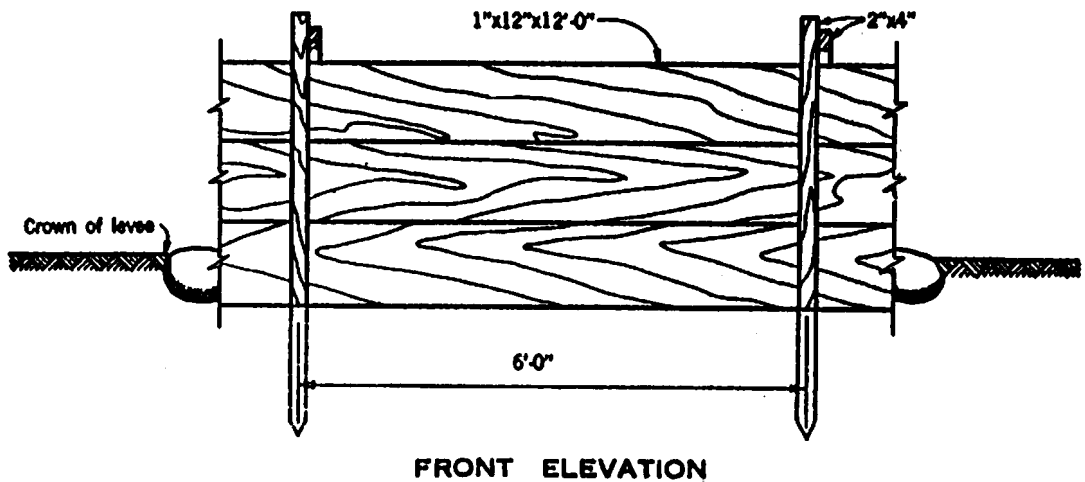
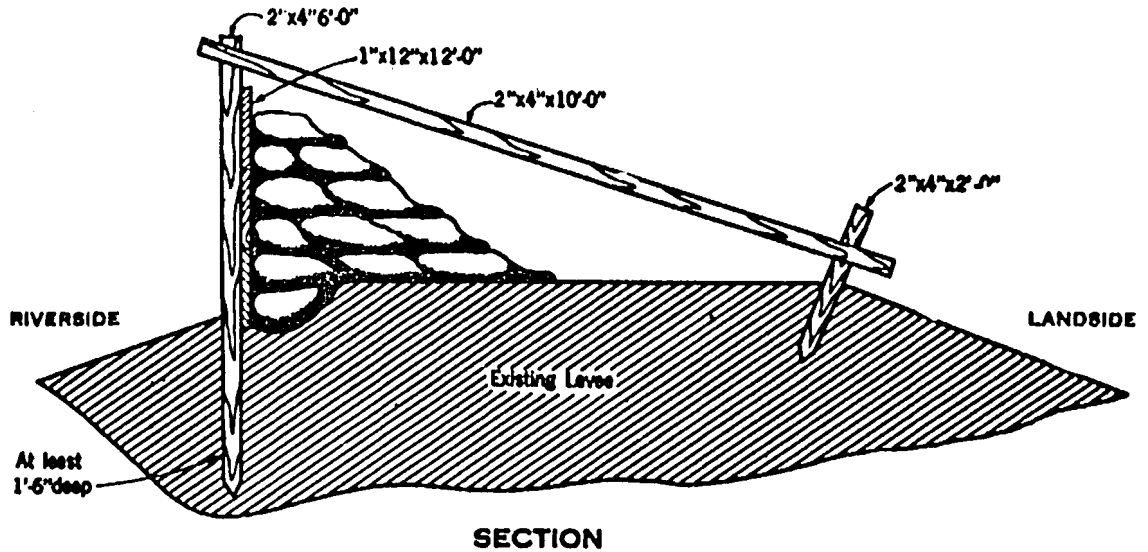
Cribs constructed of double thickness of 1"x4"x14'-0" lumber. Nail all intersections with 1-20d nail. Each intersection of walls securely fastened by a loop of No. 9 wire, tightly twisted.

BILL OF MATERIAL FOR ONE CRIB 13'-0"	
LUMBER	
130 pieces	1"x4"x14'-0"
WIRE	
30'	No. 9 wire
NAILS	
12½ lbs.	20d nails

UPPER BUTTE CREEK

CAVING BANK PROTECTION

U.S. ENGINEER OFFICE, SACRAMENTO, CALIF.



BILL OF MATERIAL FOR 100 LINEAR FEET OF LEVEE	
LUMBER	
25 pieces 1"x12"x12'-0"	
17 pieces 2"x4"x10'-0"	
• 17 pieces 2"x4"x6'-0"	
• 17 pieces 2"x4"x2'-0"	
• (Sharpened)	
NAILS	
1 lb. 8d nails	
2 lbs. 16d nails	
SANDBAGS	
1100 bags	

UPPER BUTTE CREEK

LUMBER AND SACK TOPPING

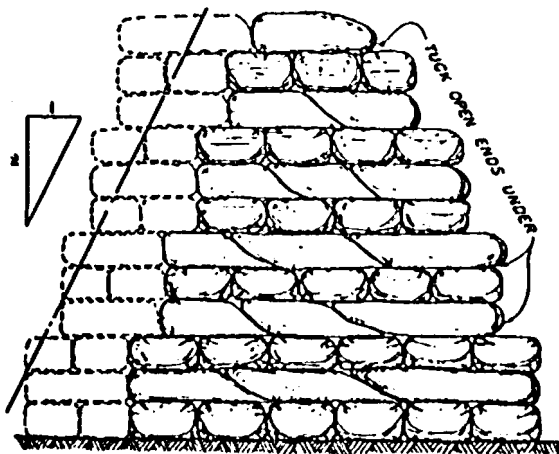
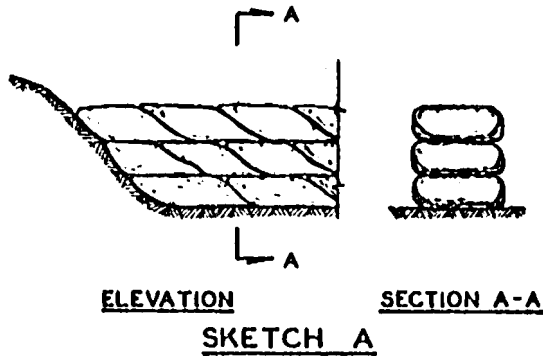
U. S. ENGINEER OFFICE, SACRAMENTO, CALIF.

LEVEE CONSTRUCTION

SANDBAGGING USED TO PREVENT OVERTOPPING OF EXISTING LEVEES AND FOR RETAINING FLOOD WATERS WHERE NO BACK-UP MATERIAL IS AVAILABLE.

INSTRUCTIONS:

1. FILL SANDBAGS 1/2 TO 2/3 FULL BUT LEAVE ENOUGH FLAP TO TURN UNDER. DO NOT TIE. LEAVE ENDS OPEN.
2. FOR HEIGHTS OF 1 FOOT AND LESS, LAY 3 SINGLE COURSES WITH BAGS LENGTHWISE AS SHOWN IN SKETCH 'A' BELOW.
3. FOR HEIGHTS GREATER THAN 1 FOOT, PLACE AS INDICATED IN SKETCH 'B' BELOW.
4. WHEN BAGS ARE PLACED FLATTEN OUT AND FILL VOIDS BY MASHING BAGS WITH FEET AND VIGOROUSLY TRAMP EACH COURSE OF THE LEVEE SECTION. THIS IS AN EXTREMELY IMPORTANT OPERATION FOR PROVIDING A LEVEE WHICH WILL BE AS IMPERVIOUS TO WATER AS POSSIBLE AND TO INSURE STABILITY OF SECTION. LOOSELY PLACED SANDBAGS IMPROPERLY KEPT TOGETHER MAY RESULT IN FAILURE AND CAUSE SERIOUS DAMAGE.

**LEVEE SECTION**

FOR HEIGHTS IN EXCESS OF THE ABOVE (APPROX. 3'-6") HOLD SAME BATTER AND BUILD ON THE SIDE AS INDICATED BY DASHED LINES ABOVE. ALTERNATE HEADER COURSES (BAGS PLACED CROSSWISE) AND STRETCHER COURSES (BAGS PLACED LENGTHWISE).

SKETCH B**ESTIMATING DATA:**

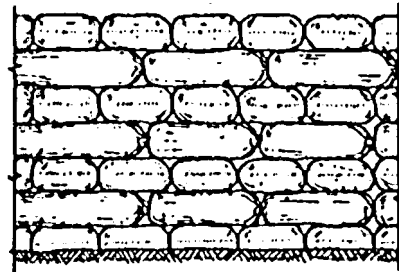
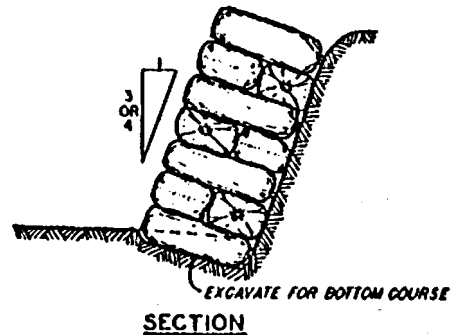
1. AVERAGE WEIGHT OF EACH FILLED SANDBAG, APPROX. 50 LBS.
2. APPROXIMATELY 1000 SANDBAGS ARE REQUIRED FOR EACH 100 SQ. FT. OF SURFACE (HEIGHT MULTIPLIED BY DISTANCE).

REKETMENTS

USED FOR EMERGENCY BANK PROTECTION TO PREVENT UNDER CUTTING AND CONTROL OF COURSE OF FLOOD CHANNELS.

INSTRUCTIONS:

1. FILL SANDBAGS 2/3 FULL AND TIE OPEN END.
2. TUCK IN BOTTOM CORNERS OF BAG AFTER FILLING.
3. PLACE BAGS PERPENDICULAR TO SLOPE.
4. LAY STRETCHER AND HEADER COURSES WITH CHOKE AND SIDE BEAMS IN: THUS:-

**ELEVATION****ESTIMATING DATA:**

1. AVERAGE WEIGHT OF EACH FILLED SANDBAG APPROXIMATELY 65 LBS.
2. APPROXIMATELY 320 SANDBAGS ARE REQUIRED FOR EACH 100 SQ. FT. OF SURFACE TO BE REVETED.

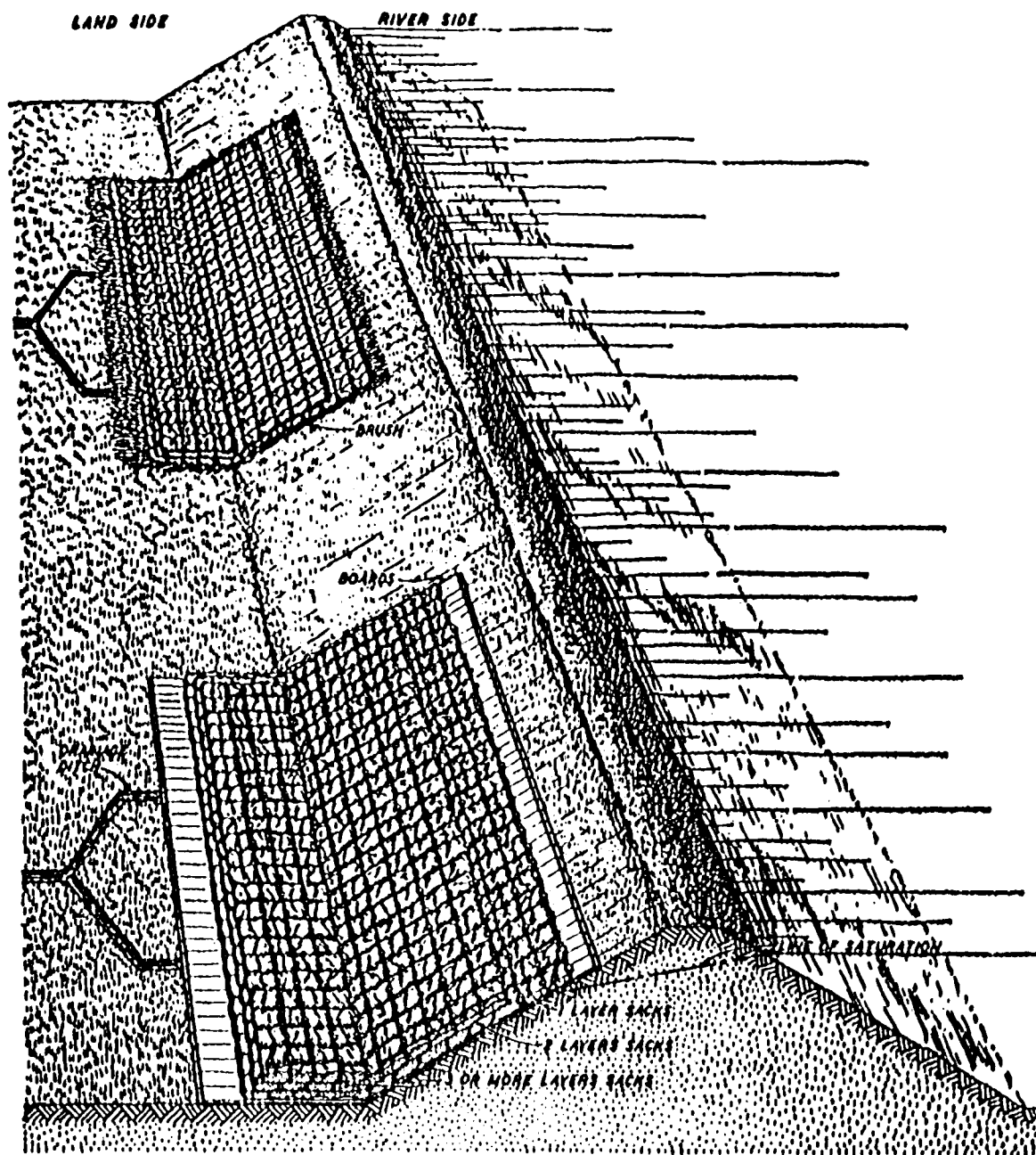
FILL MATERIAL:

THE IDEAL MATERIAL FOR FILLING SAND BAGS IS A FINE SAND OR COARSE SILT. AVOID, AS MUCH AS POSSIBLE, THE USE OF COARSE GRAVEL AND HEAVY CLAYS.

UPPER BUTTE CREEK

INSTRUCTIONS FOR PLACING SANDBAGS

U. S. ENGINEER OFFICE, SACRAMENTO, CALIF.



UPPER BUTTE CREEK

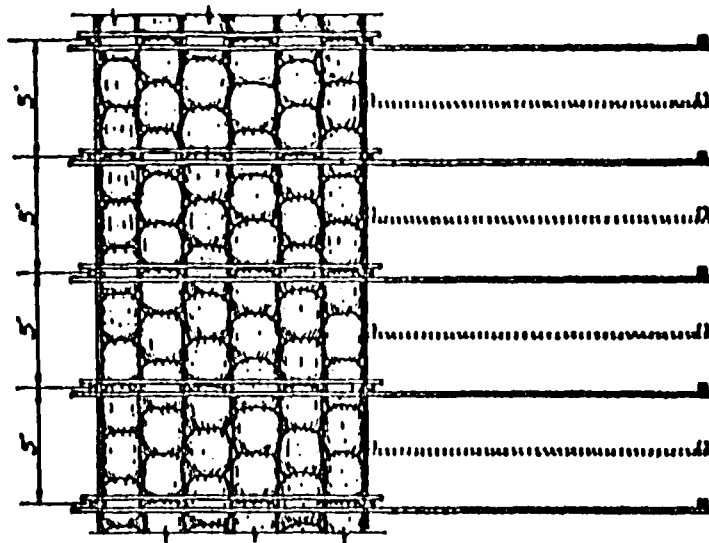
**BRUSHING AND SAKING
THE LANDSIDE SLOPE**

U.S. CORPS OF ENGINEERS, SACRAMENTO, CALIF.

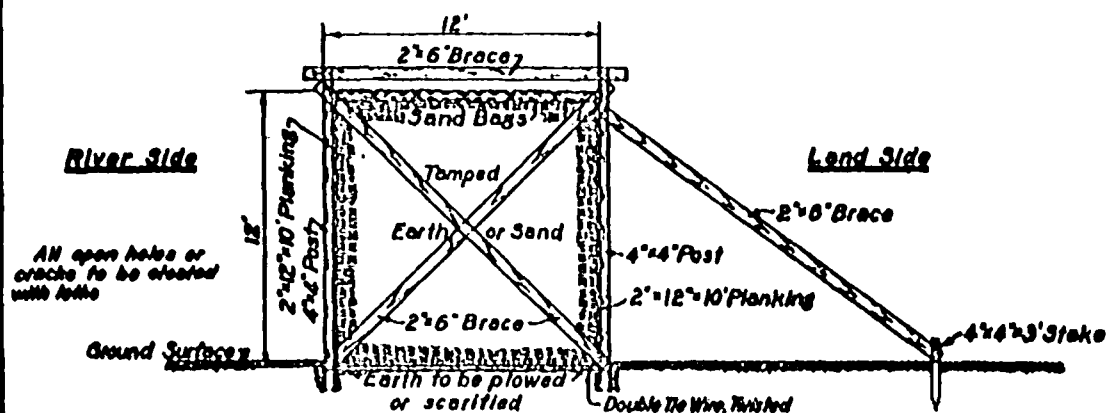
EXHIBIT Q PLATE 7



EXHIBIT C PLATE 8



PLAN



END ELEVATION

MATERIAL REQUIRED FOR 100 LINEAR FEET OF LEVEE			
LUMBER	SAND BAGS	NAILS	EARTH or SAND
48 Posts 4"x4"x16'	700	120 lbs.-20d	834 cu yds
240 Planks 2"x12"x16'		6 lbs.-3d fine	
20 Braces 2"x4"x16'			
60 Braces 4"x6"x16'		WIRE	
40 20 Straps 4"x6"x8'		20 lbs. #2 gage	
3 bundles 10ths			

Total Lumber 6967 board feet

ADDITIONAL MATERIAL FOR BRACING EACH SIDE IN BETWEEN BENTS			
LUMBER	SAND BAGS	NAILS	EARTH OR SAND
20 Posts 4"x4"		81ba-20d	
20 Braces 2"x6"			
40 Straps 4"x3"			

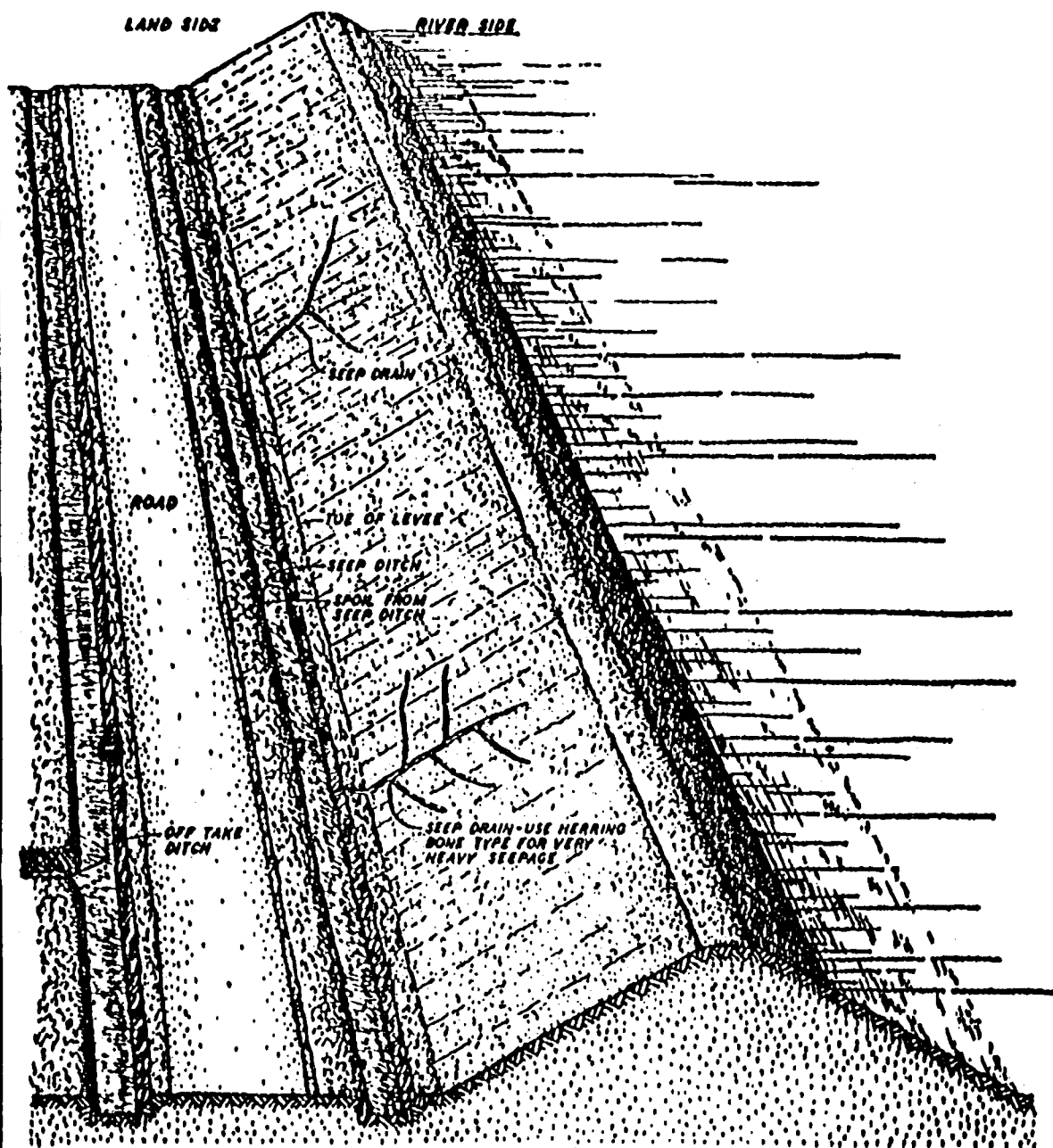
Total Lumber & Board feet

to Sharpened

UPPER BUTTE CREEK

MUD BOX BULKHEAD LEVEE CONSTRUCTION DETAILS

U.S. CORPS OF ENGINEERS, SACRAMENTO, CALIF.



UPPER BUTTE CREEK

**METHOD OF
DRAINING LEVEE SLOPE**

U.S. CORPS OF ENGINEERS, SACRAMENTO, CALIF.

EXHIBIT C PLATE 10

EXHIBIT D

SUGGESTED SEMI-ANNUAL REPORT FORM

EXHIBIT D

TO: The District Engineer
Sacramento District
Corps of Engineers
1209 - 8th Street
Sacramento, California

(1 May 19__)
(1 Nov 19__)

Dear Sir:

The semi-annual report for the period (1 May 19__ to 31 October 19__) (1 November 19__ to 30 April 19__) Upper Butte Creek Levee and Channel Improvements, Butte County, is as follows:

a. The physical condition of the protective works is indicated by the inspector's report, copies of which are inclosed, and may be summarized as follows:

(Superintendent's summary of conditions)

It is our intention to perform the following maintenance work in order to repair or correct the conditions indicated:

(Outline the anticipated maintenance operations for the following 6 months).

b. During this report period, major high water periods (water surface in Butte Creek reached or exceeded the reading of 10.0 on the State Department of Water Resources gage located at the Chico-Oroville road crossing) occurred on the following dates:

<u>Dates</u>	<u>Maximum Elevation</u>
_____	_____
_____	_____
_____	_____

Comments on the behavior of the protective works during such high water periods are as follows:

(Superintendent's log of flood observations)

During the high water stages when the water level reached a height of _____, on the gage or excess thereof (dates) _____, it was necessary to organize and carry out flood operations as follows:

(See Maintenance Manual for Upper Butte Creek - Part No. 2)

c. The inspections have indicated (no) or (the following) encroachments or trespasses upon the project right-of-way.

d. (no) (_____) permits have been issued for (the following) improvements or construction within the project right-of-way.

Executed copies of the permit documents issued are transmitted for your files.

e. The status of maintenance measures, indicated in the previous semi-annual report as being required or as suggested by the representatives of the District Engineer, is as follows:

(Statement of maintenance operations, item by item with percent completion.)

f. The fiscal statement of the Superintendent's operations for the current report period is as follows:

	<u>Labor</u>	<u>Material</u>	<u>Equipment</u>	<u>Overhead</u>	<u>Total</u>
1. Inspection					
2. Maintenance					
3. Flood fighting operations					
TOTAL					

Respectfully submitted,

Superintendent of Works

EXHIBIT D
Sheet 2 of 2

EXHIBIT E

CHECK LISTS OF LEVEES, CHANNEL AND STRUCTURES

For definition of "flood" or "high water period" see paragraph
1-06 of this manual.

CHECK LIST NO. 2

UPPER BUTTE CREEK
LEVEES AND CHANNEL IMPROVEMENT

Inspector's Report Sheet No. _____ Inspector _____

Date _____ Superintendent _____

Item	Remarks
(a) Location by Station	
(b) Settlement, sloughing, or loss of grade	
(c) Erosion of both levee slopes	
(d) Condition of roadways, including ramps	
(e) Evidence of seepage	
(f) Condition of farm gates and fencing	
(g) Maintenance measures taken since last inspection	
(h) Comments	

INSTRUCTIONS FOR COMPLETING SHEET 2, EXHIBIT E
(To be printed on back of sheet 2)

- Item (a) Indicate levee station of observation, obtained by pacing from nearest reference point; indicate right or left bank.
- Item (b) If sufficient settlement of earthwork has taken place to be noticeable by visual observation, indicate amount of settlement in tenths of a foot. If sloughing has caused a change in slope of the embankment sections, determine the new slope. Note areas where erosion or gullyng of the section has occurred.
- Item (c) If sufficient erosion or gullyng of back face or back toe of levee has taken place to be noticable by visual inspection, indicate area affected and depth.
- Item (d) Note any natural change in any section of roadway or ramps. Indicate any inadequacy in surface drainage system.
- Item (e) Indicate any evidence of seepage through the embankment section.
- Item (f) Indicate the serviceability of all farm gates across the embankments and roadway, and indicate if repainting is required.
- Item (g) Indicate maintenance measures that have been performed since last inspection and their condition at the time of this inspection.
- Item (h) Record opinion, if any, of contributory causes for conditions observed and also any observations not covered under other columns.

NOTE: One copy of the Inspector's Report is to be mailed to the District Engineer immediately on completion, and one copy is to be attached to and submitted with the Superintendent's semi-annual report.

CHECK LIST NO. 3

UPPER BUTTE CREEK
LEVEES AND CHANNEL IMPROVEMENT

Inspector's Report Sheet No. _____ Inspector _____

Date _____ Superintendent _____

Item	Remarks
(a) Name of channel and location by stations	
(b) Vegetal growth in channel	
(c) Debris and refuse in channel	
(d) New construction within right-of-way	
(e) Extent of aggradation or degradation	
(f) Condition of riprapped section	
(g) Condition of bridges	
(h) Measures taken since last inspection	
(i) Comments	

INSTRUCTIONS FOR COMPLETING SHEET 4, EXHIBIT E
(To be printed on back of Sheet 4)

- Item (a) Indicate station of observation obtained by pacing from nearest reference point.
- Item (b) Note nature, extent, and size of vegetal growth within the limits of flood flow channel.
- Item (c) Note nature and extent of debris and refuse that might cause clogging of the conduits of the irrigation intake works, fouling of the tainter gates, or the bridges over the channel.
- Item (d) Report any construction along the diversion channel or above the diversion channel or above the diversion works that has come to the attention of the inspector and that might affect the functioning of the project.
- Item (e) Indicate any change in grade or alignment of the channels, either by deposition of sediment or scour, that is noticeable by visual inspection. Estimate amount and extent.
- Item (f) Indicate any change that has taken place in the riprap such as disintegration of the rock, erosion, or movement of the rock. Note the presence of vegetal growth through the riprap.
- Item (g) Note any damage or settlement of the footings of the bridges. Indicate condition of wooden structures and if repainting is required. Indicate condition of bridge approaches, headwalls, and other appurtenances.
- Item (h) Indicate maintenance measures that have been performed since the last inspection and their condition at time of this inspection.
- Item (i) Record opinion, if any, of contributory causes for conditions observed, also any observations not covered under other columns.

NOTE: One copy of the Inspector's Report is to be mailed to the District Engineer immediately on completion and one copy is to be attached to and submitted with the Superintendent's semi-annual report.

CHECK LIST NO. 4

DRAINAGE AND IRRIGATION STRUCTURES
UPPER BUTTE CREEK

Inspector's Report Sheet No. _____
Date _____

Inspector _____
Superintendent _____

See drawings of Exhibit B for location of stations

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
Location By Station	Bank	Debris or other obstruction to flow	Damage or settlement of pipe or conduit	Condition of concrete headwall or invert paving	Condition of right-of-way adjacent to structure	Repair Measures Taken Since Last Inspection	Comments
379+00	Right						
374+90	Right						
338+04	"						
321+20	"						
309+11	"						
304+10	"						
226+54	"						
215+65	"						
215+46	"						
165+60	"						
145+53	"						
132+00	"						
126+91	"						
106+93	"						
94+76	"						
93+78	"						
73+27	"						
65+52	"						

CHECK LIST NO. 4 (CONT'D)

DRAINAGE AND IRRIGATION STRUCTURES
UPPER BUTTE CREEK

Inspector's Report Sheet No. _____
Date _____

Inspector _____
Superintendent _____

(See drawings of Exhibit B for location of stations)							
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
Location By Station	Bank	Debris or other obstruction to flow	Damage or Settlement of pipe or conduit	Condition of concrete Headwall or invert paving	Condition of right-of-way adjacent to structure	Repair Measures Taken Since Last Inspection	Comments
37+10 36+85 8+30 2+68 5+92 205+60 324+50 368+17 381+36 381+42 470+00	Right " Left " " " " " " " "						

INSTRUCTIONS FOR COMPLETING SHEETS 6 AND 7, EXHIBIT E
(To be printed on back of sheets 6 and 7)

- (1) Enter station of all structures under Column (a) for check list.
- (2) Inspect inlet, barrel, and outlet for accumulation of sediment, rubbish, and vegetal matter. Note condition under Column (c).
- (3) If any settlement or damage to the pipe, barrel, or invert of the drain has occurred, estimate the location and amount. Note particularly if any backfill has come into the pipe or been disturbed. Record observations under Column (d).
- (4) Inspect the concrete portions of the structures for evidence of settlement, cracks, "pop-outs", spaces, abrasive wear, or other deterioration. Record conditions under Column (e).
- (5) Inspect backfill area adjacent to structure for evidence of erosion caused by overflow of the drainage structure and note conditions in Column (f).
- (6) Under Column (g) indicate physical measures that have been taken to correct conditions reported in last inspection, and their condition at time of this inspection.
- (7) Under Column (h) record opinion, if any, of contributory causes for conditions observed, also any observations not covered under other columns.
- (8) A copy of the inspector's report is to be mailed to the District Engineer immediately on completion, and a record copy shall be attached to the Superintendent's semi-annual report.

EXHIBIT F

LETTER OF ACCEPTANCE BY AND TRANSFER

TO STATE RECLAMATION BOARD

EXHIBIT F

C
O
P
Y

THE RECLAMATION BOARD
OF THE
STATE OF CALIFORNIA

C
O
P
Y

January 26, 1959

District Engineer
Sacramento District
U. S. Corps of Engineers
P. O. Box 1739
Sacramento 8, California

Dear Sir:

Reference is made to your letter of December 15, 1958, file number SPKKO-P 824.3 (Sac. Riv. Minor Trib), regarding the responsibility for operation and maintenance of Unit No. 631, which extends along Butte Creek from the Durham-Oroville Road upstream approximately 4.3 miles.

The Reclamation Board, at its meeting of January 2, 1959, formally accepted the maintenance responsibility of Unit No. 631 along Butte Creek in the area described in the second paragraph of your letter under the conditions outlined in your letter.

Yours very truly,

THE RECLAMATION BOARD
A. M. BARTON
Chief Engineer and General Manager

By _____

WILLIAM A. CARVER
Assistant Secretary

WAC:lb

EXHIBIT F
Sheet 1 of 3

C
O
P
Y

C
O
P
Y

SPKKO-P 824.3 (Sac. Riv. Minor Trib.)

8 January 1958

The Reclamation Board
State of California
1215 "C" Street
Sacramento 14, California

Gentlemen:

Reference is made to District Engineer's letter dated 5 December 1957 relative to the joint inspection made on 9 December 1957, of two certain levee units and channel improvements pertaining to the Sacramento River Minor Tributaries Flood Control Improvement Project, for the purpose of transferring them to the jurisdiction of the State of California for operation and maintenance.

The required work consisting of channel improvements and levee construction was completed on 4 January 1958 in accordance with Specification No. 2532, Contract No. DA-04-167-CIVENG-58-5 and Drawing No. 50-4-3367. The levee units are along both banks of Butte Creek extending from old Highway 99E upstream to the Durham-Oroville Road.

The levee sections and channel improvements described above now meet the requirements of the Sacramento Flood Control Project, therefore said levee sections and channel improvements are hereby transferred to the State of California for operation and maintenance.

The maintenance work required under the provisions of the Sacramento River Flood Control Project shall be performed in accordance with existing Flood Control Regulations, inclosed herewith, which have been prescribed by the Secretary of the Army pursuant to Section 3 of the Act of Congress, approved 22 June 1936, as amended and supplemented by the current issue of the Standard Operation and Maintenance Manual for the Sacramento River

C
O
P
Y

C
O
P
Y

SPKKO-P 824.3 (Sac. Riv. Minor Trib.)
The Reclamation Board

Flood Control Project. As provided under Paragraph 209.10(10) of these regulations, a supplement to the Standard Operation and Maintenance Manual covering these units of work is in process of preparation and will be furnished to you upon completion.

A copy of this letter is being transmitted to the Department of Water Resources.

C
O
P
Y

THE RECLAMATION BOARD
STATE OF CALIFORNIA

C
O
P
Y

Feb 18, 1971
File No.: 4130.55.104
Your Contract: DACW05-71-
C-0028

District Engineer
U. S. Army Corps of Engineers
650 Capitol Mall
Sacramento, California 95814

Dear Sir:

Reference is made to your letter of January 22, 1971, concerning transfer to the State of California a portion of Little Chico Creek, extending from the downstream face of the Butte Creek Diversion Structure, downstream approximately 10.3 miles to the upstream side of Alberton Road Bridge, for maintenance and operation.

This work was constructed in conformance with Specification No. 985C and Contract No. DACW05-71-C-0028.

The Reclamation Board at its meeting of February 5, 1971, formally accepted the above-referred to work for operation and maintenance.

Sincerely yours,

/s/ A. E. McCollam
A. E. McCOLLAM
Chief Engineer and General Manager

EXHIBIT F

2

EDMUND G. BROWN

~~EDMUND G. BROWN~~
GOVERNOR

A. R. GALLAWAY, JR., SACRAMENTO
PRESIDENT

GROVER SHANNON, YUBA CITY
VICE PRESIDENT

GEO. H. HOLMES, CLARKSBURG
SECRETARY

W. P. HARKEY, GRIDLEY
GEO. R. WILSON, WALNUT GROVE
GEO. E. LODI, ARBUCKLE
DOUGLAS B. COHEN, BANTA

THE RECLAMATION BOARD

OF THE

STATE OF CALIFORNIA

1215 O STREET
SACRAMENTO 14, CALIFORNIA

TELEPHONE: HI 5-4711

A. M. BARTON
CHIEF ENGINEER AND GENERAL MANAGER

EDMUND G. BROWN, ATTORNEY GENERAL
LEGAL ADVISER

HOWARD S. HITCHCOCK
ASSISTANT CHIEF ENGINEER

WILLIAM A. CARVER
ASSISTANT SECRETARY

ROBERT W. JAMES
ASSOCIATE COUNSEL

January 26, 1959

District Engineer
Sacramento District
U. S. Corps of Engineers
P. O. Box 1739
Sacramento 8, California

Dear Sir:

Reference is made to your letter of December 15, 1958, file number SPKKO-P 824.3 (Sac. Riv. Minor Trib), regarding the responsibility for operation and maintenance of Unit No. 631, which extends along Butte Creek from the Durham-Oroville Road upstream approximately 4.3 miles.

The Reclamation Board, at its meeting of January 2, 1959, formally accepted the maintenance responsibility of Unit No. 631 along Butte Creek in the area described in the second paragraph of your letter under the conditions outlined in your letter.

Yours very truly,

THE RECLAMATION BOARD
A. M. BARTON

Chief Engineer and General Manager

By

William A. Carver

WILLIAM A. CARVER
Assistant Secretary

WAC:lb

Copies sent to -

Ed Jensen

Northern Area, etc.

*Vol 7
74.2*

*Butte
Creek*

*OL
wbh*

*1807/68 C
Sac. Riv. Minor Trib. Unit No. 631*

REGISTERED

RETURN RECEIPT REQUESTED

SPKKO-P 024.3 (Sac. Riv. Minor Trib)

15 DEC 1958

The Reclamation Board
State of California
2215 "O" Street
Sacramento 14, California

Gentlemen:

Reference is made to the joint inspection made on 13 November 1958, of certain levee units and channel improvements pertaining to the Sacramento River Minor Tributaries Flood Control Improvement Project, for the purpose of transferring them to the jurisdiction of the State of California for operation and maintenance.

The required work consisting of channel improvements and levee construction was completed on 10 December 1958 in accordance with Specification No. 2380, Contract No. DA-04-167-CIVENG-58-65 and Drawing No. 50-4-3350. This work is designated as Unit No. 631 and extends along Butte Creek from the Durham-Oroville Road upstream approximately 4.3 miles.

The levee sections and channel improvements described above now meet the requirements of the Project, therefore said levee sections and channel improvements are hereby transferred to the State of California for operation and maintenance.

The maintenance work required under the provisions of the Sacramento River Flood Control Project shall be performed in accordance with existing Flood Control Regulations, inclosed herewith, which have been prescribed by the Secretary of the Army pursuant to Section 3 of the Act of Congress, approved 22 June 1936, as amended and supplemented by the current issue of the Standard Operation and Maintenance Manual for the Sacramento River Flood Control Project. As provided under Paragraph 208.10(10) of these regulations, a supplement to the Standard Operation and Maintenance Manual covering these units of work will be furnished to you upon completion.

REGISTERED

RETURN RECEIPT REQUESTED

Vol 7
Cont. # 58-65
Unit # 631

OPERATIONS BRANCH

REGISTERED

RETURN RECEIPT REQUESTED

15 DEC 1958

SPKCO-P-824.3 (Sac Riv FCP)
The Reclamation Board

A copy of this letter is being transmitted to the Department of
Water Resources.

Sincerely yours,

1 Incl
F.C. Reg.

Copy furnished:
Dept Water Res
23rd & "B" Sts
Sacto, Calif. w/o incl
O.C.E. w/o incl
SoPacDivnEngr w/o incl

A. E. McCOLLAM
Colonel, CE
District Engineer

cc: Opers Br w/o incl
Engr Divn w/o incl
Northern Area Ofc w/o incl

V077

REGISTERED

RETURN RECEIPT REQUESTED

A. R. GALLAWAY, JR., SACRAMENTO
PRESIDENT

GROVER SHANNON, YUBA CITY
VICE PRESIDENT

GEO. H. HOLMES, CLARKSBURG
SECRETARY

W. P. HARKEY, GRIDLEY
GEO. R. WILSON, WALNUT GROVE
GEO. E. LODI, ARBUCKLE
DOUGLAS B. COHEN, SANTA

EARL WARREN
GOVERNOR

A. M. BARTON
CHIEF ENGINEER AND GENERAL MANAGER
EDMUND G. BROWN, ATTORNEY GENERAL
LEGAL ADVISER
G. F. MELLIN
ASSISTANT ENGINEER AND APPRAISER
S. A. HONAKER
ASSISTANT SECRETARY

THE RECLAMATION BOARD
OF THE
STATE OF CALIFORNIA
1100 O STREET
SACRAMENTO 14, CALIFORNIA
TELEPHONE: GI 3-4671

May 12, 1953

District Engineer
Sacramento District
U. S. Corps of Engineers
P. O. Box 1739
Sacramento, California

Dear Sir:

Reference your letters effecting transfer of certain flood control works to the State of California as follows:

1. Letter File No. SPKKO-P 824.3 (Butte Creek) dated 9 June 1952, Channel improvement and levee construction work located along Butte Creek from U.S. Highway 99E downstream 8.7 miles, and waterway banks contiguous thereto. *325*
2. Letter File No. SPKKO-P 824.3 (Sac. R.F.C.P.) dated 10 November 1951, Lower Butte Creek project from the Gridley road upstream to a point approximately 1-1/2 miles south of the Glenn Butte County line. *301*
3. Letter file No. SPKKO-P 824.3 (Sac. R.F.C.P.) dated 19 June 1952, levee enlargement and drainage facilities along the left bank of Cache Slough at Lookout Slough Closure, and contiguous waterway bank. *336*

The Reclamation Board, on behalf of the State of California in meeting held May 6, 1953, accepted subject Flood control works for operation and maintenance.

Yours very truly

THE RECLAMATION BOARD
A. M. BARTON
Chief Engineer and General Manager

[Signature]
D. M. CARR

DMC:cmh
CC: State Engineer

5699

124.3 (Sac. R.F.C.P.) SPC
VOL 17 Upper Butte Creek #12
Letter No. 31
Letter No. 23
Unit 109
Letter No. 32
Units 301, 325, 336
Letter No. 39

EXHIBIT G
SAMPLE PERMIT
for
USE OF RIGHT-OF-ENTRY

EXHIBIT G

EXHIBIT
PERMIT

(Name of Levee Commission or City)

(Location)

Permission is hereby granted to:

(Name of Firm or Individual)

(Address)

TO: (Describe in these spaces the proposal, including kind and type of construction, purpose intended, location by stationing. Indicate passageway provided by means of gates, etc. Use separate sheets if necessary, identifying each by reference herein.)

Porvided That:

Upon termination or expiration of this permit (whether by voluntary relinquishment by the grantee, by revocation by the grantor or otherwise) the grantee shall remove all structures, improvements, or appurtenances which may have been erected or constructed under this permit, and shall repair or replace any portion of the flood protection structure or right-of-way which may have been damaged by his operations (including grading and seeding, or sodding, if necessary), to the satisfaction of the grantor.

The structure or operation for which this permit is issued shall be maintained by the grantee in such manner as shall not injure or damage the flood protection structure, or interfere with its operation and maintenance in accordance with regulations of the Secretary of the Army.

The structure or operation covered by this permit may be damaged, removed or destroyed by the grantor in time of flood emergency if such action is determined by the grantor to be necessary in order to preserve life or property or prevent damage or impairment to the

use or safety of the flood protection structure, and the grantor shall not be liable to the grantee for such damage or destruction.

Unless otherwise specifically provided herein, this permit may be cancelled at any time by the grantor upon 10 days written notice mailed to the address shown above. During such 10 day period, (or such other period as may be provided herein), the grantee will be permitted to remove any property or improvements installed under this permit, and to repair or replace any damage to the flood protection right-of-way or structures resulting from his use or operations. At the end of such period, the grantor shall have the right to possess and dispose of any such property or improvements remaining upon its right-of-way, and may proceed to repair or replace any such damage, and the grantee herein shall be liable to the grantor for the full cost of such repairs or replacements.

The construction, installation and maintenance of the structure or structures covered by this permit shall be subject to inspection by representatives of the grantor and the United States at all reasonable times.

In the event the work covered by this permit consists of or includes major construction, the cost of inspection thereof by the grantor and/or the United States shall be paid by the applicant.

Grantee agrees that it will not use the area or facilities covered by this permit, or permit such area to be used, for any purpose other than is specifically covered by this permit.

(Use these spaces for special conditions applicable to this permit.)

THIS PERMIT SHALL NOT BE VALID UNTIL APPROVED BY THE DISTRICT ENGINEER, CORPS OF ENGINEERS, U. S. ARMY, OR HIS AUTHORIZED REPRESENTATIVE.

Signature(Grantor) (Title) (Date)

Terms of this permit Approved:
are hereby accepted

Signature(Grantee) (Date) (Date)

District Engineer

EXHIBIT G
Sheet 2 of 4

REGULATIONS GOVERNING ISSUANCE OF PERMITS FOR USE OF
RIGHTS-OF-WAY FOR FLOOD PROTECTION PROJECTS

As the flood protection works and rights-of-way are owned by the Local Interests and will be operated and maintained by them in accordance with the Regulations of the Secretary of the Army, and issuance of any permits to use any part of the rights-of-way will be handled by the Local Interests, with the restriction that no such permit may be issued without the approval of the District Engineer, as stated in paragraph No. 208.10, (a) General, (5) of the Regulations, a copy of which is attached hereto.

Applications for use of the rights-of-way should be addressed to The City or Levee Commission having jurisdiction over the local flood protection project. The City or Levee Commission will then forward the application to the District Engineer, Corps of Engineers, Sacramento, California, with its recommendation, with reasons for such recommendation. It is suggested that the application and recommendations be forwarded with a draft copy of the permit, in order that all objectionable features may be eliminated prior to its proffer to the applicant as this may prevent misunderstandings and arguments. If for any reason it is desired to forward the permit itself without this intervening step, five copies of the proposed permit should be included on which is stated the exact use of the rights-of-way, for which permission is being requested, together with any condition or restriction of the permit. The permit should be signed by the applicant and an official of the Local Interests. A drawing, sketch or detail plans as may be required to show the exact location, nature of work and proposed method of construction should be attached to each copy of permit. If the permit is approved by the District Engineer, three copies will be returned. This will enable each party concerned to have a copy of the approved permit.

In any case where a permit is requested for any purpose which might cause disfigurement or damage to the flood protection rights-of-way or structure in its erection, use, or removal, it is suggested that the applicant be required to post a bond of sufficient amount to protect the Local Interests from any cost of repair or removal, and to guarantee faithful performance of the permit conditions. In such cases the permit should state the amount and conditions of the bond.

In cases involving major construction or other work which may directly affect the flood protection structure, it will be necessary that the United States inspect the work and the Local Interests may also desire to inspect it. As stated in the permit form, such inspection will be at the expense of the grantee, and this should be called to his attention. Except in cases of known financial security arrangements should be made with the grantee for an advance deposit

or bond to cover such costs.

There is attached hereto a copy of a permit form which has been successfully used by a number of cities and levee committees.

EXHIBIT H
GAPS IN LEVEE THAT MAY
REQUIRE SANDBAGGING

EXHIBIT H

UPPER BUTTE CREEK

GAPS IN LEVEE THAT MAY REQUIRE SANDBAGGING

Location	Adjacent Levee Grade	Standard Project Flood Plane(1)	Project Design Flood Plane(2)	Elev. Bottom of Ballast	Width of Gap (Feet)	Approx. flow at which sack- ing is required c.f.s.
Sacramento Northern Railway (right bank)	150.0	150.0	146.5	145.0	20	23,000
Southern Pacific Railroad (right bank)	147.2	147.0	142.4	140.5	20	23,000
Southern Pacific Railroad (left bank)	144.9	144.8	139.9	142.8	20	34,000
Old Highway 99E (right bank)	146.0	144.3	141.5	141.5	35	27,000
Old Highway 99E (left bank)	144.9	144.4	139.0	141.6	35	33,000

All elevations are U. S. Corps of Engineers Datum

NOTE: (1) Flow = 40,000 c.f.s. Frequency estimated at once in 200 years.

(2) Flow = 27,000 c.f.s. Frequency estimated at once in 50 years.